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KEY

TO

SMITH'S PRACTICAL AND MENTAL ARITHMETIC.

DESIGNED FOR TEACHERS ONLY.

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KEY

TO THE

"PRACTICAL AND MENTAL ARITHMETIC"

FOR THE USE OF TEACHERS.

BY ROSWELL C. SMITH,

AUTHOR OF "PRACTICAL AND MENTAL ARITHMETIC," "INTELLECTUAL AND PRACTICAL GRAMMAR," "THE PRODUCTIVE GRAMMAR," AND "INTRODUCTORY ARITHMETIC."

HARTFORD:
JOHN PAINE.
1841.

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The utility, and even necessity, of a work of this description, will scarcely be questioned by those who have had any experience in teaching Arithmetic. Most young persons, after having been persuaded, again and again, to review a long arithmetical process, feel, or affect to feel, certain that they have performed it correctly, although the result, by the book, is erroneous. They then apply to their instructer; and, unless he points out their mistake, or performs the operation for them, they become discouraged, think it useless "to try" longer, and the foundation for a habit of idleness is thus imperceptibly established. Now, in a large school, it is always inconvenient, and sometimes impossible, for the instructer to devote the time necessary to overlook or perform a very simple, much more a complex, question in Arithmetic. This is at once obviated by having at hand a Key, to which reference can be easily and speedily made. The time of the teacher will thus be saved, and the pupil will not have his ardor damped by being told that "his sum is wrong," without learning where or how.

This work is not designed for, and can scarcely become, a help to laziness. Its object is to lighten the burden of teachers, and facilitate the progress of scholars. To promote both of these important purposes, it is now presented to the public.

January, 1834.

KEY.

SIMPLE ADDITION.

¶ VII. (p. 30.)

More Exercises for the Slate.

17. *Answer.* 150.
18. *A.* 1965.
19. *A.* 17172.
20. *A.* 2292021.
21. *A.* 1834359807543.
22. *A.* 2556449433123.
23. *A.* 310774410776655 6675.
24. *A.* 1097384085.
25. *A.* 7366214613759.
26. *A.* 205266666570061111523238.

(32.)

25
365
2145
89485
9000006
90009000

A. 99101026.

SIMPLE SUBTRACTION.

¶ VIII. (p. 36.)

More Exercises for the Slate.

18. *A.* 77; 44 = 121.
19. *A.* 118; 134 = 252.
20. *A.* 86; 76 = 162.
21. *A.* 300; 450 = 750.
22. *A.* 400; 600 = 1000.
23. *A.* 500; 300 = 800.
24. *A.* 600; 1150 = 1750.
25. *A.* 914; 2239 = 3153.
26. *A.* 1539; 538 = 2077.
27. *A.* 7829542; 7836472 = 15666014.
28. *A.* 1; 1112 = 1113.
29. *A.* 75000; 67655 = 142655.
30. *A.* 899999; 899990 = 1799989.
31. *A.* 899900; 899000 = 1798900.
32. *A.* 890000; 899900 = 1789900.
33. *A.* 999999; 999990 = 1999989.

(34.)	(35.)	(36.)
9000000	19000000	40000000
3	19	1000000
A. 8999997.	*A.* 189 9981.	*A.* 39000000.

SIMPLE MULTIPLICATION.

¶ X. (p. 39.)

More Exercises for the Slate.

8. *A.* 240; 360 = 600.
9. *A.* 6055; 7266 = 13321

10. *A*. 8477; 9688 = 18165.
11. *A*. 587889; 391926 = 979815.
12. *A*. 522568; 653210 = 1175778.
13. *A*. 1358016; 493824 = 1851840.
14. *A*. 370368; 617280 = 987648.
15. *A*. 1036836; 2764896 = 3801732.
16. *A*. 4147344; 2419284 = 6566628.
17. *A*. 37035020367; 49380027156 = 86415047523.
18. *A*. 61725033945; 74070040734 = 135795074679.
19. *A*. 472240026; 708360039 = 1180600065.

¶ XI. (p. 40.) WHEN THE MULTIPLIER IS MORE THAN 12.

More Exercises for the Slate.

6. *A*. 3510; 3042 = 6552.
7. *A*. 4352; 7424 = 11776. 29696; 26880 = 56576.
8. *A*. 108; 171 = 279. 225; 324 = 549.
9. *A*. 3059; 5635 = 8694.
11. *A*. 496048; 531480 = 1027528.
12. *A*. 1043472; 1108689 = 2152161.
13. *A*. 3948428; 4364052 = 8312480.
14. *A*. 5195300; 7273420 = 12468720.
15. *A*. 2086527365; 2728535785 = 4815063150.
16. *A*. 866711367; 1059313893 = 1926025260.
17. *A*. 1000 × 25 = 25000 + 5000 = 30000 — 29999 = 1.

¶ XII. (p. 41.) WHEN THE MULTIPLIER IS 10, 100, 1000, &c.

Exercises for the Slate.

2. *A*. 8700; 87000; 870000; 870 = 966570.
3. *A*. 89780; 897800; 8978000; 89780000; 897800000; 8978000000 = 9975545580.

¶ XIII. (p. 42.) WHEN THERE ARE CIPHERS AT THE RIGHT HAND OF EITHER OR BOTH THE FACTORS.

Exercises for the Slate.

(2.)

62123000
130000
186369
62123
A. 8075990000000.

(3.)

35432000
256000
212592
177160
70864
A. 9070592000000.

(4.)

6789354270000
685300
2036806281
3394677135
5431483416
4073612562
A. 4652744481231000000.

(5.)

78954398765
7235000
394771993825
236863196295
157908797530
552680791355
A. 571235075064775000.

(6.)

123456789
123450000
617283945
493827156
370370367
246913578
123456789
A 15240740602050000.

(7.)

1234567890
1234560000
740740734
617283945
493827156
370370367
246913578
123456789
A. 1524148134278400000.

¶ XIV. (p. 43.) WHEN THE MULTIPLIER IS A COMPOSITE NUMBER.

2. *A.* 29 × 6 = 174 × 6 = 1044.
3. *A.* 3065428 × 5 = 15327140 × 7 = 107289980.
4. *A.* 4078945 × 8 = 32631560 × 12 = 391578720.
5. *A.* 18934 × 9 = 170406 × 12 = 2044872.
6. *A.* 45678 × 12 = 548136 × 12 = 6577632.

SHORT DIVISION.

¶ XVI. (p. 47.)

More Exercises for the Slate.

14. *A.* 189283 — 1; 126189 = 315472 — 1.
15. *A.* 139467; 92978 = 232445.
16. *A.* 85596; 64197 = 149793.
17. *A.* 51357 — 3; 42798 = 94155 — 3.
18. *A.* 16335541 — 3; 13068433 — 2 = 29403974 — 5.
19. *A.* 10890361 — 1; 9334595 — 2 = 20224956 — 3.
20. *A.* 130866974 — 2; 87244649 — 4 = 218111623 — 6.
21. *A.* 74781128 — 2; 65433487 — 2 = 140214615 — 4.
22. *A.* 379040 — 6; 331660 — 6 = 710700 — 12.
23. *A.* 294809 — 5; 265328 — 6 = 560137 — 11.
24. *A.* 5816 — 1; 5234 — 5 = 11050 — 6.
25. *A.* 4758 — 7; 4362 — 1 = 9120 — 8.

LONG DIVISION.

¶ XVII. (p. 49.)

More Exercises for the Slate.

12. *A.* 750; 500 = 1250.
16. *A.* 1938; 1615 = 3553.
17. *A.* 1530; 1710 = 3240.

18. *A.* 384; 288 = 672.
19. *A.* 192; 576 = 768.
20. *A.* 24; 12 = 36.

¶ XVIII. (p 50.) WHEN THE DIVISOR IS A COMPOSITE NUMBER.

3. *A.* 2520 ÷ 7 = 360 ÷ 9 = 40.

4. *A.* 5040 ÷ 4 = 1260 ÷ 7 = 180. 5040 ÷ 3 = 1680 ÷ 5 = 336. 5040 ÷ 3 = 1680 ÷ 8 = 210. 5040 ÷ 7 = 720 ÷ 12 = 60. 5040 ÷ 5 = 1008 ÷ 7 = 144. 5040 ÷ 6 = 840 ÷ 12 = 70.

¶ XIX. (p. 51.)

Exercises for the Slate.

3. 1st quotient, 8765342
2d quotient, 876534
3d quotient, 87653
4th quotient, 8765
5th quotient, 876
6th quotient, 87
A. 9739257.

¶ XX. (p. 52.)

Exercises for the Slate.

3. *A.* 373.
4. *A.* 1735654.
5. *A.* 635428.
6. *A.* 165321.

Miscellaneous Questions on the foregoing. (p. 53.)

(3.)

692784578
27839421
692784578
1385569156
2771138312
6235061202
2078353734
5542276624
4849492046
1385569156
A. 19286721529249338.

(10.)

180000000
380000000
99000000
21000000
2000000

A. 682000000.

(13.)

1st answer, 15,590
2d answer, 45,378
3d answer, 19,440
4th answer, 16,122
5th answer, 2,396
6th answer, 12,150
7th answer, ,863
8th answer, 3,440

A. 115,379.

14. *A.* 3066 + 58400 = 61466.

15. *A.* 216810 + 649700 = 866510.

16. *A.* 37 × 10 = 370 × 15 = 5550 × 26 = 144300 × 45 = 6493500 × 24 = 155844000 + 6493500 + 144300 + 5550 + 370 + 37 = 162487757.

17. *A.* 120 ÷ 60 = 2. 4800 ÷ 60 = 80 + 2 = 82.

18. *A.* 2880 + 17280 = 20160.

ADDITION OF FEDERAL MONEY.

¶ XXIII. (p. 60.)

10. *A.* 4713,12 + 9426,24 = 14139,36.

MULTIPLICATION OF FEDERAL MONEY.

¶ XXV. (p. 62.)

Exercises for the Slate.

(2.)
×2=$ 4,50
×3=$ 6,75
×4=$ 9,00
×5=$11,25
×7=$15,75
×9=$20,25
A. $67,50.

(3.)
× 12=$27,00
× 15=$33,75
× 18=$40,50
× 23=$51,75
A. $153,00.

(4.)
× 26=$ 58,50
× 37=$ 83,25
× 53=$119,25
× 75=$168,75
A. $429,75.

(5.)
× 85=$191,25
× 150=$337,50
× 183=$411,75
× 165=$371,25
A. $1311,75.

(6.)
× 250=$ 562,50
× 800=$1800,00
A. $2362,50.

(8.)
× 2=$ 354,050
× 3=$ 531,075
× 5=$ 885,125
× 6=$1062,15
A. $2832,40.

(9.)
× 7=$1239,175
× 9=$1593,225
× 10=$1770,250
A. $4602,650.

(11.)
× 3=$ 97,50
× 12=$390,00
× 15=$487,50
A. $975,00.

(12.)
× 25=$ 812,50
× 35=$1137,50
× 150=$4875,00
A. $6825,00.

(14.)
× 3=$1095,465
× 5=$1825,775
× 6=$2190,930
A. $5112,17.

(15.)
× 8 = $2921,240
× 12 = $4381,860
× 15 = $5477,325
A. $12780,425.

(16.)
× 16 = $5842,480
× 20 = $7303,100
× 25 = $9128,875
A. $22274,455.

(17.)
× 30 = $10954,650
× 35 = $12780,425
× 40 = $14606,200
A. $38341,275.

(18.)
× 45 = $16431,975
× 50 = $18257,750
× 55 = $20083,525
A. $54773,250.

(19.)
× 60 = $21909,300
× 65 = $23735,075
× 67 = $24465,385
A. $70109,760.

(20.)
× 75 = $27386,625
× 79 = $28847,245
× 90 = $32863,950
× 100 = $36515,500
A. $125613,320.

DIVISION OF FEDERAL MONEY.

¶ XXVI. (p. 64.)

More Exercises for the Slate.

(10.)
÷ 2 = $500,30
÷ 3 = $333,533
÷ 4 = $250,15
÷ 6 = $166,766
÷ 8 = $125,075
A. $1375,824 +

(11.)
÷ 10 = $100,06
÷ 15 = $ 66,706
÷ 18 = $ 55,588
÷ 25 = $ 40,024
A. $262,378 +

(12.)

÷ 28 = $35,735
÷ 35 = $28,588
÷ 40 = $25,015
÷ 45 = $22,235
÷ 60 = $16,676
A. $128,249 +

(13.)

÷ 70 = $14,294
÷ 85 = $11,771
÷ 95 = $10,532
÷ 100 = $10,006
÷ 150 = $ 6,67
A. $53,273 +

(14.)

÷ 200 = $5,003
÷ 240 = $4,169
÷ 360 = $2,779
÷ 400 = $2,501
÷ 550 = $1,819
A. $16,271 +

(15.)

÷ 17 = $58,858
÷ 19 = $52,663
÷ 89 = $11,242
÷ 98 = $10,21
÷ 199 = $ 5,028
A. $138,001 +

¶ XXVII. (p. 66.)

More Exercises for the Slate.

(4.

× $22\frac{3}{11}$ = $ 245
× $22\frac{4}{11}$ = $ 246
× $23\frac{7}{11}$ = $ 260
× $3\frac{9}{11}$ = $ 42
× $31\frac{10}{11}$ = $ 351
× $99\frac{6}{11}$ = $1095
A. $2239.

(5.)

× $2\frac{3}{4}$ = $ 33
× $5\frac{1}{2}$ = $ 66
× $6\frac{2}{3}$ = $ 80
× $8\frac{9}{12}$ = $105
× $10\frac{1}{6}$ = $122
× $15\frac{1}{2}$ = $186
× $25\frac{1}{2}$ = $306
A. $898.

(6.)

× $2\frac{1}{60}$ = $ 2420
× $3\frac{1}{40}$ = $ 3630
× $5\frac{20}{600}$ = $ 6040
× $8\frac{555}{600}$ = $10710
× $12\frac{598}{600}$ = $15598
A. $38398.

¶ XXVIII.

Exercises for the Slate. (p. 68.)

(3.)

$\div 4 = \$1170$

$\div 4 = \$\ 900$

$\div 4 = \$1050$

A. \$3120.

(4.)

$\div 16 = \$\ 400$

$\div 16 = \$2000$

$\div 16 = \$8000$

A. \$10400.

(5.)

$\div 8 = \$337{,}50$

$\div 8 = \$675{,}00$

$\div 8 = \$135{,}00$

A. \$1147,50.

(7.)

$\div\ 2 = \$600$

$\div\ 3 = \$400$

$\div\ 4 = \$300$

$\div\ 5 = \$240$

$\div\ 8 = \$150$

$\div 16 = \$\ 75$

A. \$1765.

(8.)

$\div\ 6 = \$450$

$\div 10 = \$540$

A. \$990.

(10.)

$\times 12\frac{1}{4} = \$453{,}25$

$\times 15\frac{1}{2} = \$573{,}50$

A. \$1026,75.

(11.)

$\times 3\frac{1}{2} = \$\ 94500{,}00$

$\times 2\frac{1}{3} = \$\ 63000{,}00$

$\times 1\frac{1}{8} = \$\ 30375{,}00$

$\times 4\frac{1}{16} = \$109687{,}50$

$\times 1\frac{1}{20} = \$\ 28350{,}00$

A. \$325912,50 +

Questions involving the Principles of the foregoing Rules

(p. 69.)

(2.)

10
30
1000000
26000
101

A. 1026141.

(9.)

25432
67345

127160
101728
76296
178024
152592

A. 1712718040.

12. *A.* 18 × 3 = 54 × 25 = $13,50.

13. *A.* 30 × 87 = 26,10. 30 × 53 = 15,90. 8 × 125 = 10,00. 2 × 62 = 124. 10 × 4 = 40. 15 × $2,37\frac{1}{2}$ = 35,625 + 26,10 + 15,90 + 10,00 + 124 + 40 = $251,625.

14. *A.* 4800 — 2400 = 2400 ÷ 121 = $$19\frac{101}{121}$.

15. *A.* 9 + 4 + 3,75 + 21,25 = $38. 31,25 + 2,975 + 75 + 16,875 = 51,85 — 38 = $13,85.

16. *A.* 4 × 60 = 240 × 49 = 11760 × $37\frac{1}{2}$ = $4410.

17. *A.* 4 ÷ 2 = 2. 200 ÷ 2 = 100 + 2 = 102. 860000 ÷ 2 = 430000. 1000000 ÷ 2 = 5000000 + 430000 = 930000.

18. *A.* 4 × 3 = 12. 8 × 3 = 24 + 12 = 36 ÷ 2 = 18. 28 × 3 = 84. 50 × 3 = 150 + 234 ÷ 2 = 117.

19. *A.* 60 × 46 = 2760. 60 × 69 = 4140 + 2760 = 6900 ÷ 23 = 300.

FARMERS' BILLS. (p. 70.)

2. *A.* 20 × 6 = $120
25 × $2,12\frac{1}{2}$ = $ 53,125
200 × $,06\frac{1}{4}$ = $ 12,50
18 × $,08\frac{3}{4}$ = $ 1,575
18 × $,03\frac{3}{4}$ = $,675
36 × $,27\frac{3}{4}$ = $ 9,99
17 × ,75 = $ 12,75

$210,61,5.

MERCHANT'S BILL. (p. 71.)

3800 × 17¾ = 674,50
360 × 60 = 2160 × 24 = 518400 × 19¾ = 102384,00
40 × 37 = 1480 × 462½ = 6845,00
400 × 118 = 472,00
200 × 42 = 8400 × 39 = 3276,00
$113651 0.

REDUCTION.

¶ XXIX.

WINE MEASURE.

Exercises for the Slate. (p. 72.)

1. *A.* 4 × 4 = 16. 20 × 4 = 80 + 16 = 96.
2. *A.* 16 ÷ 4 = 4. 80 ÷ 4 = 20 + 4 = 24.
3. *A.* 2 × 2 = 4. 480 × 2 = 960 + 4 = 964.
4. *A.* 4 ÷ 2 = 2. 960 ÷ 2 = 480 + 2 = 482.
5. *A.* 2 × 63 = 126. 4137 × 63 = 260631 + 126 = 260757.

ALE OR BEER MEASURE.

Exercises for the Slate. (p. 73.)

6. *A.* 2 × 2 = 4. 3600 × 2 = 7200 + 4 = 7204.
7. *A.* 4 ÷ 2 = 2. 7200 ÷ 2 = 3600 + 2 = 3602.
8. *A.* 2 × 36 = 72. 620 × 36 = 12320 + 72 = 12392.

CLOTH MEASURE.

Exercises for the Slate. (p. 74.)

9. *A.* $2 \times 4 = 8.$ $26872 \times 4 = 107488 + 8 = 107496$

10. *A.* $8 \div 4 = 2.$ $107488 \div 4 = 26872 + 2 = 26874.$

11. *A.* $3 \times 4 = 12.$ $42000 \times 4 = 168000 + 12 = 168012.$

12. *A.* $12 \div 4 = 3.$ $168000 \div 4 = 42000 + 3 = 42003.$

DRY MEASURE.

Exercises for the Slate. (p. 75.)

13. *A.* $3 \times 2 = 6.$ $321 \times 2 = 642 + 6 = 648.$

14. *A.* $6 \div 2 = 3.$ $1284 \div 2 = 642 + 3 = 645.$

15. *A.* $2 \times 4 = 8.$ $32 \times 4 = 128 + 8 = 136.$

TROY WEIGHT.

Exercises for the Slate. (p. 76.)

16. *A.* $2 \times 12 = 24.$ $4200 \times 12 = 50400 + 24 = 50424.$

17. *A.* $24 \div 12 = 2.$ $120000 \div 12 = 10000 + 2 = 10002.$

18. *A.* $4 \times 12 = 48 \times 20 = 960 \times 24 = 23040.$ $3600 \times 12 = 43200 \times 20 = 864000 \times 24 = 20736000 + 23040 = 20759040.$

AVOIRDUPOIS WEIGHT.

Exercises for the Slate. (p. 77.)

19. *A.* $2 \times 20 = 40.$ $2832 \times 20 = 56640 + 40 = 56680.$

20. *A.* $2 \times 16 = 32.$ $104000 \times 16 = 1664000 + 32 = 1664032.$

21. *A.* $8 \div 4 = 2.$ $240 \div 4 = 60 + 2 = 62.$

22. *A.* $1 \times 4 = 4.$ $4 \times 28 = 112.$

APOTHECARIES' WEIGHT.

Exercises for the Slate. (p. 78.)

23. *A.* $2 \times 8 = 16.$ $4360 \times 8 = 34880 + 16 = 34896$

24. *A.* $16 \div 8 = 2.$ $6464 \div 8 = 808 + 2 = 810.$

LONG MEASURE.

Exercises for the Slate. (p. 79.)

25. *A.* $2 \times 8 = 16$. $26784 \times 8 = 214272 + 16 = 214288$.

26. *A.* $80 \div 40 = 2$. $627360 \div 40 = 15684 + 2 = 15686$.

27. *A.* $2 \times 5\frac{1}{2} = 11$. $11010 \times 5\frac{1}{2} = 60555 + 11 = 60566$.

28. *A.* $11 \times 2 = 22 \div 11 = 2$. $66 \times 2 = 132 \div 11 = 12$.

29. *A.* $132 \times 2 = 264 \div 11 = 24$. $4224 \times 2 = 8448 \div 11 = 768 + 24 = 792$.

30. *A.* $2 \times 3 = 6$. $278365 \times 3 = 835095 + 6 = 835101$.

LAND OR SQUARE MEASURE.

Exercises for the Slate. (p. 80.)

31. *A.* $2 \times 40 = 80$. $450 \times 40 = 18000 + 80 = 18080$.

32. *A.* $2 \times 640 = 1280$. $2342 \times 640 = 1498880 + 1280 = 1500160$.

33. *A.* $4 \times 30\frac{1}{4} = 121$. $193600 \times 30\frac{1}{4} = 5856400 + 121 = 5856521$.

SOLID OR CUBIC MEASURE.

Exercises for the Slate. (p. 81.).

34. *A.* $2 \times 128 = 256$. $28 \times 128 = 3840$.

35. *A.* $2 \times 1728 = 3456$. $2800 \times 1728 = 4838400 + 3456 = 4841856$.

36. *A.* $345600 \div 1728 = 200$. $691200 \div 1728 = 400 + 200 = 600$.

TIME.

Exercises for the Slate. (p. 83.)

37. *A.* $120 \div 60 = 2$. $960360 \div 60 = 16006 + 2 = 16008$.

38. *A.* $4 \times 365\frac{1}{4} = 1461$. $44 \times 365\frac{1}{4} = 16071 + 1461 = 17532$.

39. *A.* $2 \times 7 = 14$. $318 \times 7 = 2226 + 14 = 2240$.

CIRCULAR MOTION.

Exercises for the Slate. (p. 84.)

40. *A.* $2 \times 30 = 60$. $3602 \times 30 = 108060 + 60 = 108120$.

41. *A.* $120 \div 60 = 2$. $192000 \div 60 = 3200 + 2 = 3202$.

STERLING MONEY.

Exercises for the Slate. (p. 86.)

42. *A.* $3 \times 20 = 60$. $4200 \times 20 = 84000 + 60 = 84060$.

43. *A.* $3 \times 12 = 36$. $2600 \times 12 = 31200 + 36 = 31236$.

44. *A.* $4 \times 4 = 16$. $2700 \times 4 = 10800 + 16 = 10816$.

45. *A.* $8 \div 4 = 2$. $6200 \div 4 = 1550 + 2 = 1552$.

◆

PRACTICAL APPLICATION OF REDUCTION.

More Exercises for the Slate. (p. 89.)

48. *A.* $8 \times 4 = 32 \times 5 = \$1,60$.

49. *A.* $20 \times 4 = 80$. $40 \times 4 = 160 + 80 = 240$.

50. *A.* $80 \div 4 = 20$. $120 \div 4 = 30 + 20 = 50$.

51. *A.* $5 \times 63 = 315 \times 3 = \$945$.

52. *A.* $126 \div 63 = 2$. $945 \div 63 = 15 + 2 = 17$.

53. *A.* $63 \times 4 = 252 \times 6 = \$15,12$.

54. *A.* $63 \times 3 = 189 \times 4 = 756$. $100 \times 63 = 6300 \times 4 = 25200 + 756 = 25956$.

55. *A.* $756 \div 4 = 189 \div 63 = 3$. $252 \div 4 = 63 \div 63 = 1 + 3 = 4$.

56. *A.* $1 \times 2 = 2 \times 2 = 4 \times 63 = 252 \times 4 = 1008 \times 2 = 2016 \times 4 = 8064 \times 5 = \$403,20$.

57. *A.* $10 \times 2 = 20 \times 2 = 40 \times 63 = 2520 \times 4 = 10080 \times 2 = 20160 \times 4 = 80640$.

58. *A.* 3 cwt. 2 qrs. $= 392$ lbs. $\times 8 = \$31,36$.

59. *A.* $15 \times 4 = 60 + 1 = 61 \times 28 = 1708$.

60. *A.* 3 × 4 = 12 × 8 = 96.

61. *A.* 20 × 12 = 240.

62. *A.* 5 × 20 = 100 × 12 = 1200. 10 × 20 = 200 × 12 = 2400 + 1200 = 3600.

63. *A.* 480 ÷ 12 = 40 ÷ 20 = 2. 1440 ÷ 12 = 120 ÷ 20 = 6 + 2 = 8.

64. *A.* 4 × 20 = 80 × 12 = 960 × 4 = 3840.

65. *A.* 2 × 28 = 56 × 6 = 336.

66. *A.* 336 ÷ 6 = 56 ÷ 28 = 2.

67. *A.* 1 × 2 = 2 × 2 = 4 × 63 = 252 × 4 = 1008 × 2 = 2016 × 4 = 8064 × 6 = $483,84.

68. *A.* 483,84 ÷ 6 = 8064 ÷ 4 = 2016 ÷ 1008 ÷ 4 = 252 ÷ 63 = 4 ÷ 2 = 2 ÷ 2 = 1.

69. *A.* 16 gals. 2 qts. = 66 qts. × 9 = 594.

70. *A.* 594 ÷ 9 = 66 ÷ 4 = 16 gals. 2 qts.

71. *A.* 10 oz. 5 pwts. 18 grs. = 4938 grs. × 5 = $24,69.

72. *A.* 2469 ÷ 5 = 4938 ÷ 24 = 205 pwts. 18 grs. 205 ÷ 20 = 10 oz. 5 pwts.

73. *A.* 5 cwt. 2 qrs. 18 lbs. = 634 lbs. × 12 = $76,08.

74. *A.* 7608 ÷ 12 = 634 lbs. ÷ 28 = 22 qrs. 18 lbs. 22 ÷ 4 = 5 cwt. 2 qrs.

75. *A.* 2 yrs. 6 mo. 3 wks. 6 da. 12 h. = 20820 hours × 9 = 187380.

76. *A.* 187380 ÷ 9 = 20820 ÷ 24 = 867 d. 12 h. 867 ÷ 7 = 123 wks. 6 da. 123 ÷ 4 = 30 mo. 3 wks. 30 ÷ 12 = 2 yrs. 6 mo.

77. *A.* 4 × 4 = 16 × 4 = 64 × 20 = $12,80.

78. *A.* 64 ÷ 4 = 16 ÷ 4 = 4 × 3,20 = $12,80.

79. *A.* 1£. 2 s. 6½ d. = 1082 farth. × 20 = 21640.

80. *A.* 20 bu. 0 pks. 3 qts. 1 pt. = 1287 pts. × 6 = $77,22.

81. *A.* 5 T. 1 p. 1 hhd. 2 gals. 2 qts. 1 pt. 3 gills, = 46455 gills, × 2 = 92910 ÷ 4 = 23227 d. 2 qr. ÷ 12 = 1935 s. 7 d. 2 qr.

82. *A.* 8 yds. 1 qr. = 33 qrs. × 2 = 66 s. ÷ 6 = $11.

83. *A.* 50 gals. 2 qts. 1 pt. 2 gills, = 1622 gills × 2 = 3244 ÷ 12 = 270,33 + ÷ 6 = $45,055 +.

84. *A.* 3600 × 6 = 21600 × 12 = 259200 × 4 = 1036800.

85. *A.* $1036800 \div 4 = 259200 \div 12 = 21600 \div 6 = 3600$.

86. *A.* $25 \times 28 = 700 \times 12 = 8400$.

87. *A.* $8400 \div 12 = 700 \div 28 = 25$.

88. *A.* $15 \times 12 = 180 \times 8 = 1440 \times 3 = 4320 \times 20 = 86400$.

89. *A.* $86400 \div 20 = 4320 \div 3 = 1440 \div 8 = 180$.

90. *A.* $256 \times 320 = 81920 + 30 = 81950$.

91. *A.* $81950 \div 320 = 256$ m. 30 rods.

92. *A.* $15 \times 3 = 45 + 1 = 46 \times 8 = 368 + 6 = 374 \times 40 = 14960 + 28 = 14988 + 5\frac{1}{2} = 82434 + 4 = 82438 \times 3 = 247314 \times 12 = 2967768 \times 3 = 8903304$.

93. *A.* $8903304 \div 3 = 2967768 \div 12 = 247314 \div 3 = 82438 \times 2 = 164876 \div 11 = 14988 + 4$ yds. $\div 40 = 374 + 28$ rods $\div 8 = 46 + 6$ fur. $\div 3 = 15$ lea. $+ 1$ m.

94. *A.* $360 \times 5 = 1800 + 4 = 1804 \times 4 = 7216 + 2 = 7218$.

95. *A.* $7218 \div 4 = 1804 + 2$ na. $\div 5 = 360$ E. E. $+ 4$ qrs.

96. *A.* $3000 \times 3 = 9000 \times 4 = 36000$.

97. *A.* $36000 \div 4 = 9000 \div 3 = 3000$.

98. *A.* $500 \times 4 = 2000$.

99. *A.* $2000 \div 4 = 500$.

100. *A.* $15 \times 50 = 750 \times 1728 = 1296000$.

101. *A.* $1296000 \div 1728 = 750 \div 50 = 15$.

102. *A.* $20 \times 128 = 2560 \times 1728 = 4423680$.

103. *A.* $4423680 \div 1728 = 2560 \div 128 = 20$.

104. *A.* $500 \times 4 = 2000 + 3 = 2003 \times 8 = 16024 + 7 = 16031 \times 2 = 32062 + 1 = 32063$.

105. *A.* $32063 \div 2 = 16031 + 1$ pt. $\div 8 = 2003 + 7$ qts. $\div 4 = 500 + 3$ pks.

106. *A.* $20 \times 2 = 40 \times 2 = 80 \times 63 = 5040 \times 4 = 20160 \times 2 = 40320 \times 4 = 161280$.

107. *A.* $161280 \div 4 = 40320 \div 2 = 20160 \div 4 = 5040 \div 63 = 80 \div 2 = 40 \div 2 = 20$.

108. *A.* $360 \times 365\frac{1}{4} = 131490 + 300 = 131790 \times 24 = 3162960 + 20 = 3162980 \times 60 = 189778800 + 50 = 189778850 \times 60 = 11386731000 + 37 = 11386731037$.

109 *A.* $11386731037 \div 60 = 189778850 + 37$ sec. $\div 60$

= 3162980 + 50 min. ÷ 24 = 131790 + 20 h. ÷ $365\frac{1}{4}$ = 360 yrs. + 300 da.

110. *A.* 8 × 30 = 240 × 60 = 14400 × 60 = 864000.

111. *A.* 20 × 21 = 420 × 28 = 11760 s. × 12 = 141120 d. × 4 = 564480 far.

112. *A.* 5 lbs. 6 oz. 20 grs. = 31700 grs. × 5 = 158500.

113. *A.* 6 lbs. 11 oz. 15 grs. = 39855 grs. 239130 ÷ 39855 = 6.

114. *A.* 5 lbs. 3 oz. = 1260 pwt. 2 oz. 2 pwt. = 42. 1260 ÷ 42 = 30.

115. *A.* 2 lbs. 8 oz. = 640 pwt. 1 lb. 10 oz. = 440 pwt. 11 oz. = 220 pwt. 1 oz. 15 pwt. = 35 pwt. 640 + 440 + 220 + 35 = 1335. 2 lbs. 7 oz. 3 pwts. = 623 × 15 = 9345 ÷ 1335 = 7.

116. *A.* 12 × 4 = 48 × 28 = 1344. 26880 ÷ 1344 = 20.

117. *A.* 360 × $69\frac{1}{2}$ = 25020 × 8 = 200160 × 40 = 8006400 × $5\frac{1}{2}$ = 44035200 × 3 = 132105600 × 12 = 1585267200 × 3 = 4755801600.

118. *A.* 300 × 8 = 2400 × 40 = 96000 × $5\frac{1}{2}$ = 528000 × 3 = 1584000 × 12 = 19008000 ÷ (9 ft. 2 in. =) 110 inch. = 172800.

119. *A.* 172800 × (9 ft. 2 inch.) = 110 inch. = 19008000 ÷ 12 = 1584000 ÷ 3 = 528000 × 2 = 1056000 ÷ 11 = 96000 ÷ 40 = 2400 ÷ 8 = 300.

120. *A.* 45 × 8 = 360 × 40 = 14400 × $5\frac{1}{2}$ = 79200 × 3 = 237600 × 12 = 2851200 ÷ (15 ft. 9 inch.) = 189 inch. = 15085 +.

121. *A.* 400 — 200 = 200 × 4 = 800 × 40 = 32000.

122. *A.* 27 × 24 = 648 + 7 = 655 × 60 = 39300 + 43 = 39343 × 60 = 2360580 + 5 = 2360585.

123. *A.* 1828 × $365\frac{1}{4}$ = 667677 × 24 = 16024248 × 60 = 961454880 × 60 = 57687292800.

124. *A.* 21 × $365\frac{1}{4}$ = $7670\frac{1}{4}$ × 24 = 184086 × 60 = 11045160 × 60 = 662709600.

125. *A.* 20 × $365\frac{1}{4}$ = 7305 × 24 = 175320. 2000000 ÷ 175320 = $11\frac{71480}{175320}$.

COMPOUND ADDITION.

¶ XXX.

More Exercises for the Slate. (p. 96.)

19. *A.* 70£. 9 s. 1 d. 2 qrs.
20. *A.* 1482£. 13 s.
21. *A.* 119£. 3 s. 7 d. 2 qrs.
22. *A.* 36 lbs. 8 oz. 6 pwt. 16 grs.
23. *A.* 21 cwt. 2 qrs. 25 lbs.
24. *A.* 237 yds. 2 na.
25. *A.* 13 pks. 4 qts.
26. *A.* 132 gals.
27. *A.* 334 lea. 0 m. 5 fur. 24 po.
28. *A.* 1284 acres, 1 rood, 16 rods.
29. *A.* 44 ft. 1532 in.
30. *A.* 73 yrs. 178 da. 14 h. 51 m. 32 sec.
31. *A.* 24 S. 3° 19′ 10″.

COMPOUND SUBTRACTION.

¶ XXXI.

More Exercises for the Slate. (p. 100.)

(20.)	(21.)	(22.)
1£. 0 s.	1£. 0 s. 0 d.	1£. 0 s. 0 d. 0 qrs.
2 s.	2d.	2 qrs.
A. 0£. 18 s.	*A.* 0£. 19 s. 10 d.	*A.* 0£. 19 s. 11 d. 2 qrs.

¶ XXXIII. *Questions to exercise the foregoing Rules.* (p. 104, 105.)

(1.)	(2.)	(3.)
1	15,	75,000
2000	1,375	,375
30000	6,125	*A.* 74,625.
4000000	*A.* 22,500.	
20000		
19		
400000000		
A. 404052020.		

4. *A.* 3200 ÷ 16 = 200; 3200 ÷ 8 = 400; 3200 ÷ 4 = 800 + 400 + 200 = 1400.

5. *A.* 31557600 × 5½ = 173566800.

6. *A.* 31557600 ÷ 60 = 525960 ÷ 60 = 8766 ÷ 24 = 365¼ ÷ 365¼ = 1.

7. *A.* 1 × 2 = 2 × 2 = 4 × 63 = 252 × 4 = 1008 × 2 = 2016 × 4 = 8064 × 4 = 322,56.

8. *A.* 322,56 ÷ 4 = 8064 ÷ 4 = 2016 ÷ 2 = 1008 ÷ 4 = 252 ÷ 63 = 4 ÷ 2 = 2 ÷ 2 = 1.

9. *A.* 1100 × 2 = 2200 ÷ 11 = 200; 3300 × 2 = 6600 ÷ 11 = 600 + 200 = 800.

10. *A.* 300 × 20 = 6000 ÷ 6 = 1000; 900 × 20 = 18000 ÷ 6 = 3000 + 1000 = 4000.

11. *A.* 5 × 20 = 100 + 17 = 117 × 12 = 1404 + 6 = 1410 × 4 = 5640.

12. *A.* 5640 ÷ 4 = 1410 ÷ 12 = 117 s. + 6 d. ÷ 20 = 5£. + 17 s.

13. *A.* 3600 × 25⅙ = 90600.

14. *A.* 1 × 20 = 20 × 4 = 80 × 28 = 2240 × 16 = 35840 × 5 = 179,20.

15. *A.* 1 × 4 = 4 × 4 = 16 × 2¼ = 36 × 2 = 72.

16. *A.* 1 × 2 = 2 × 2 = 4 × 63 = 252 × 4 = 1008 × 2 = 2016 × 4 = 8064 gills.

17. *A.* 20 × 4 = 80 × 8 = 640 × 2 = 1280 pints.

18. *A.* 4 × 20 = 80 × 4 = 320 × 28 = 8960 × 16 = 143360 × 16 = 2293760 drams.

19. *A.* 3000 × 8 = 24000 × 40 = 960000 × $5\frac{1}{2}$ = 5280000 × 3 = 15840000 × 12 = 190080000 × 3 = 570240000 b. c.

20. *A.* 20 × $365\frac{1}{4}$ = 7305 × 24 = 175320 × 60 = 10519200 × 60 = 631152000 times.

21. *A.* 75£. 14 s. 6 d. × 3 = 227£. 3 s. 6 d.; 75£. 14 s. 6 d. ÷ 6 = 12£. 12 s. 5 d., Mary's part; 75£. 14 s. 6 d. + 227£. 3 s. 6 d. + 12£. 12 s. 5 d. = 315£. 10 s. 5 d. — 20£. 13 s. 8 d. = 294£. 16 s. 9 d., Susan's part.

BILL.

A.	1 s. 6 d. ×	3 yds. =	0£. 4 s. 6 d.
	4 s. 6 d. ×	20 cwt. =	4£. 10 s. 0 d.
	3 s. 9 d. ×	25 bu. =	4£. 13 s. 9 d.
	5 £. 10 s. ×	3 cows, =	16£. 10 s. 0 d.
			25£. 18 s. 3 d.

FRACTIONS.

¶ XXXV.

More Exercises for the Slate. (p. 110.)

2. *A.* 28 ÷ 5 = $5\frac{3}{5}$ barrels.
3. *A.* 365 ÷ 5 = $73.
4. *A.* 1201 ÷ 60 = $20\frac{1}{60}$.

¶ XXXVI.

More Exercises for the Slate. (p. 111.)

2. *A.* 20 × 60 = 1200 + 1 = $\frac{1201}{60}$.
3. *A.* 72 × 12 = 864 + 10 = $\frac{874}{12}$.
4. *A.* 4 × 9 = 36 + 2 = $\frac{38}{9}$.

¶ XXXVII.

More Exercises for the Slate. (p. 113.)

2. *A.* $\frac{72}{84} \div 12 = \frac{6}{7}$.
6. *A.* $\frac{324}{648} \div 12 = \frac{27}{54} \div 9 = \frac{3}{6} \div 3 = \frac{1}{2}$.
7. *A.* $\frac{1429}{2858} \div 1429 = \frac{1}{2}$.

¶ XXXVIII.

Exercises for the Slate. (p. 114, 115.)

1. *A.* $\frac{3}{15} \times 30 = \frac{90}{15} = 6$.
2. *A.* $\frac{3}{20} \times 205 = \frac{615}{20} = 30\frac{15}{20} = 30\frac{3}{4}$ dollars.
3. *A.* $\frac{3}{8} \times 400 = \frac{1200}{8} = \$150$.
4. *A.* $\frac{3}{17} \times 6 = \frac{18}{17}$, and $18 \div 17 = 1\frac{1}{17}$.
15. *A.* $367 \times 3\frac{1}{4} = 1192\frac{3}{4}$.
16. *A.* $211 \times 6 = 1266$; $211 \times 7 = 1477 \div 8 = 184\frac{5}{8} + 1266 = 1450\frac{5}{8}$.
17. *A.* $42 \times 3 = 126$; $42 \times 5 = 210 \div 60 \times 3\frac{30}{60} + 126 = 129\frac{30}{60} = 129\frac{1}{2}$.

¶ XXXIX.

Exercises for the Slate. (p. 115.)

1. *A.* $600 \times 3 = 1800 \div 16 = \$112\frac{1}{2}$.
2. *A.* $2700 \div 8 = \$337\frac{1}{2}$.
3. *A.* $425 \times 5 = 2125$; $425 \div 5 = 85 + 2125 = 2210$.
4. *A.* $272 \times 15 = 4080$; $272 \times \frac{3}{4} = 204 + 4080 = 4284$.
5. *A.* $999 \times 21 = 20979$; $999 \times \frac{2}{9} = 222 + 20979 = 21201$.
6. *A.* $20 \times 5 = 100$; $20 \times \frac{3}{40} = 1\frac{20}{40} = 1\frac{1}{2} + 100 = 101\frac{1}{2}$.

¶ XL.

Exercises for the Slate. (p.117.)

1. *A.* $\frac{8}{16}\div 8=\frac{1}{16}$.

2. *A.* $\frac{6}{8\times 8}=\frac{6}{64}=\frac{3}{32}$.

3. *A.* $\frac{4}{15\times 6}=\frac{4}{90}=\frac{2}{45}$.

8. *A.* $2\times 13=26+11=\frac{37}{13\times 4}=\frac{37}{52}$.

9. *A.* $16\frac{3}{8}=\frac{131}{8\times 5}=\frac{131}{40}=3\frac{11}{40}$.

10. *A.* $25\frac{4}{21}=\frac{529}{21\times 20}=\frac{529}{420}=1\frac{109}{420}$

11. *A.* $8\frac{3}{7}=\frac{59}{7\times 6}=\frac{59}{42}=1\frac{17}{42}$.

12. *A.* $114\frac{1}{5}=\frac{571}{5\times 280}=\frac{571}{1400}$.

¶ XLI.

Exercises for the Slate. (p. 118, 119.)

2. *A.* $\frac{7}{25}\times\frac{5}{8}=\frac{35}{200}=\frac{7}{40}$.

4. *A.* $\frac{3}{4}\times\frac{2}{3}\times\frac{4}{9}=\frac{24}{108}=\frac{2}{9}$.

9. *A.* $5\frac{1}{2}=\frac{11}{2}\times\frac{11}{2}=\frac{121}{4}=30\frac{1}{4}$.

10. *A.* $\frac{33}{2}\times\frac{33}{2}=\frac{1089}{4}=272\frac{1}{4}$.

11. *A.* $20\frac{3}{11}=\frac{223}{11}\ \&\ \frac{1}{2}\times\frac{1}{3}=\frac{1}{6}\times\frac{223}{11}=\frac{223}{66}=3\frac{25}{66}$.

¶ XLII.

Note to this paragraph. (p. 120.)

2. *A.* 144 ÷ 132 = 12 remainder; 132 ÷ 12 = 11 times and no remainder; therefore 12, the last divisor, is the answer.

3. *A.* 168 ÷ 84 = 0 remains.

4. *A.* 48 ÷ 24 = 0 remains; then 96 ÷ 24, the last divisor, = 0 remains; therefore 24, being the last divisor without a remainder, is the answer.

6. *A.* 1000 ÷ 750 = 250 rem.; 750 ÷ 250 = 0 rem.; the common divisor, then, is 250, the last divisor; $\frac{750}{1000} \div 250 = \frac{3}{4}$.

7. *A.* 630 ÷ 420 = 210 rem.; 420 ÷ 210 = 0 rem.; $\frac{420}{630} \div 210 = \frac{2}{3}$.

8. *A.* 1000 ÷ 660 = 340 rem.; 660 ÷ 340 = 220 rem.; 340 ÷ 220 = 120 rem.; 220 ÷ 120 = 100 rem.; 120 ÷ 100 = 20 rem.; 100 ÷ 20 = 0 rem.; therefore 20, the last divisor, is the common divisor; then $\frac{660}{1000} \div 20 = \frac{33}{50}$.

¶ XLII.

(For the Note see the foregoing.)

More Exercises for the Slate. (p. 122.)

3. *A.* 4) 4 . 16
1 . 4
4 × 1 × 4 = 16.

4. *A.* 5) 10 . 15
2 . 3
5 × 2 × 3 = 30.

5. *A.* 5) 30 . 35 . 6
6) 6 . 7 . 6
1 . 7 . 1
5 × 6 × 1 × 7 × 1 = 210.

6. *A.* 3) 27 . 51
9 . 17
3 × 9 × 17 = 459.

7. *A.*

$$\begin{array}{r|l} 4) & \underline{3 \;.\; 12 \;.\; 8} \\ 3) & \underline{3 \;.\; 3 \;.\; 2} \\ & 1 \;.\; 1 \;.\; 2 \end{array}$$

$4 \times 3 \times 1 \times 1 \times 2 = 24.$

8. *A.*

$$\begin{array}{r|l} 4) & \underline{4 \;.\; 12 \;.\; 20} \\ & 1 \;.\; 3 \;.\; 5 \end{array}$$

$4 \times 1 \times 3 \times 5 = 60.$

9. *A.*

$$\begin{array}{r|l} 7) & \underline{2 \;.\; 7 \;.\; 14 \;.\; 49} \\ 2) & \underline{2 \;.\; 1 \;.\; 2 \;.\; 7} \\ & 1 \;.\; 1 \;.\; 1 \;.\; 7 \end{array}$$

$7 \times 2 \times 1 \times 1 \times 1 \times 7 = 98.$

¶ XLIII.

More Exercises for the Slate. (p. 123.)

2. *A.* $3 \times 8 = 24$; $7 \times 4 = 28$; $4 \times 8 = 32$; $\frac{24}{32}$, $\frac{28}{32}$.

3. *A.* $4 \times 3 = 12$; $2 \times 5 = 10$; $5 \times 3 = 15$; $\frac{12}{15}$, $\frac{10}{15}$.

4. *A.* $3 \times 11 = 33$; $10 \times 4 = 40$; $4 \times 11 = 44$; $\frac{33}{44}$, $\frac{40}{44}$.

5. *A.* $8 \times 7 \times 2 = 112$; $6 \times 9 \times 2 = 108$; $1 \times 7 \times 9 = 63$; $9 \times 7 \times 2 = 126$; $\frac{112}{126}$, $\frac{108}{126}$, $\frac{63}{126}$.

6. *A.* $7 \times 5 \times 7 = 245$; $4 \times 9 \times 7 = 252$; $3 \times 5 \times 9 = 135$; $9 \times 5 \times 7 = 315$; $\frac{245}{315}$, $\frac{252}{315}$, $\frac{135}{315}$.

7. *A.* $\frac{1 \times 2}{2 \times 3} = \frac{2}{6}$; $2 \times 7 = 14$; $5 \times 6 = 30$; $6 \times 7 = 42$; $\frac{14}{42}$, $\frac{30}{42}$.

8. *A.* Omitting 14, the whole number, we say, $3 \times 6 = 18$; $5 \times 4 = 20$; $4 \times 6 = 24$; adding 14 makes $14\frac{18}{24}$, $\frac{20}{24}$.

9. *A.* $\frac{1 \times 5}{2 \times 6} = \frac{5}{12}$; $3 \times 12 = 36$; $5 \times 8 = 40$; $8 \times 12 = 96$; $10\frac{36}{96}$, $\frac{40}{96}$.

10. *A.* $11 \times 7 = 77$; $1 \times 21 = 21$; $21 \times 7 = 147$; adding whole numbers to the fractions makes $8\frac{77}{147}$, $14\frac{21}{147}$.

12. *A.* $\begin{array}{r|l} 4) & \underline{4 \;.\; 8} \\ & 1 \;.\; 2 \end{array}$; $4 \times 1 \times 2 = 8$ com. denom.; $8 \times \frac{3}{4} = 6$; $8 \times \frac{5}{8} = 5$; $\frac{6}{8}$, $\frac{5}{8}$.

13. *A.* $\begin{array}{r|l} 5) & \underline{5 \;.\; 10} \\ & 1 \;.\; 2 \end{array}$; $5 \times 1 \times 2 = 10$; $10 \times \frac{3}{5} = 6$; $10 \times \frac{1}{10} = 1$; $\frac{6}{10}$, $\frac{1}{10}$.

14. *A.* $\begin{array}{r} 2\,)\underline{6\ .\ 4} \\ 3\ .\ 2 \end{array}$; $2 \times 3 \times 2 = 12$; $12 \times \frac{5}{6} = 10$; $12 \times \frac{3}{4} = 9$; $14\frac{10}{12}$, $13\frac{9}{12}$.

16. *A.* $\frac{1}{3} \times 4 = \frac{4}{12}, \frac{9}{12}$.

17. *A.* $\frac{500}{1000} \div 250 = \frac{2}{4}, \frac{1}{4}$.

18. *A.* $\frac{80}{240} \div 10 = \frac{8}{24}, \frac{5}{24}$.

19. *A.* $\frac{4}{80} \div 4 = \frac{1}{20}, \frac{3}{20}$.

◆

ADDITION OF FRACTIONS.

¶ XLIV.

More Exercises for the Slate. (p. 126.)

3. *A.* $\frac{3}{4}, \frac{1}{5}, \frac{1}{3}, = \frac{45}{60}, \frac{12}{60}, \frac{20}{60}$; $16\frac{45}{60} + 17\frac{12}{60} + 3\frac{20}{60} = 37\frac{17}{60}$.

4. *A.* $\frac{3}{5} = \frac{21}{35}$; $\frac{4}{7} = \frac{20}{35}$; $\frac{20}{35} + \frac{21}{35} = \frac{16}{35}$.

5. *A.* $5 \times 9 \times 11 = 495$; $8 \times 7 \times 11 = 616$; $8 \times 9 \times 7 = 504$; $7 \times 9 \times 11 = 693$; $\frac{495}{693} + \frac{616}{693} + \frac{504}{693} = \frac{1615}{693} = 2\frac{229}{693}$.

6. *A.* $2 \times 9 \times 4 = 72$; $8 \times 13 \times 4 = 416$; $1 \times 9 \times 13 = 117$; $13 \times 9 \times 4 = 468$; $\frac{72}{468} + \frac{117}{468} + \frac{416}{468} = \frac{605}{468} = 1\frac{137}{468}$.

7. *A.* $14\frac{3}{4} = 14\frac{9}{12}$; $15\frac{5}{6} = 15\frac{10}{12}$; $15\frac{10}{12} + 14\frac{9}{12} = 30\frac{7}{12}$

8. *A.* $\frac{1}{2}$ of $\frac{5}{6} = \frac{5}{12}$; $\frac{3}{8}$ of $\frac{1}{3} = \frac{3}{24}$; $\frac{5}{12}, \frac{3}{24} = \frac{120}{288} + \frac{36}{288} = \frac{156}{288}$.

9. *A.* $\frac{1}{2}$ of $\frac{5}{6} = \frac{5}{12}$; $\frac{1}{5}, \frac{5}{12}, \frac{7}{8} = \frac{96}{480} + \frac{200}{480} + \frac{420}{480} = \frac{716}{480} = 1\frac{236}{480} = 1\frac{59}{120} + 3 = 4\frac{59}{120}$.

SUBTRACTION OF FRACTIONS.

¶ XLV.

More Exercises for the Slate. (p. 127, 128.)

2. *A.* $40\times6=240$; $5\times41=205$; $41\times6=246$; $\frac{240}{246}-\frac{205}{246}=\frac{35}{246}$.

3. *A.* $11\times11=121$; $4\times15=60$; $15\times11=165$; $\frac{121}{165}-\frac{60}{165}=\frac{61}{165}$.

4. *A.* $15\times7=105$; $4\times16=64$; $16\times7=112$; $\frac{105}{112}-\frac{64}{112}=\frac{41}{112}$.

5. *A.* $7\times5=35$; $2\times8=16$; $8\times5=40$; $\frac{35}{40}-\frac{16}{40}=\frac{19}{40}$.

6. *A.* $15\times9=135$; $5\times16=80$; $16\times9=144$; $\frac{135}{144}-\frac{80}{144}=\frac{55}{144}+1=1\frac{55}{144}$.

7. *A.* $\frac{3}{4}\times\frac{4}{8}=\frac{12}{32}$; $12\times9=108$; $1\times32=32$; $32\times9=288$; $\frac{108}{288}-\frac{32}{288}=\frac{76}{288}\div4=\frac{19}{72}$.

8. *A.* $\frac{1}{2}\times\frac{6}{10}=\frac{6}{20}$; $\frac{1}{2}\times\frac{9}{26}=\frac{9}{52}$; $6\times52=312$; $9\times20=180$; $20\times52=1040$; $\frac{312}{1040}-\frac{180}{1040}=\frac{132}{1040}\div2=\frac{66}{520}$.

9. *A.* $\frac{2}{3}\times\frac{19}{1}=\frac{38}{3}$; $19\frac{1}{2}=\frac{39}{2}$; $39\times3=117$; $38\times2=76$; $2\times3=6$; $\frac{117}{6}-\frac{76}{6}=\frac{41}{6}=6\frac{5}{6}$.

DIVISION OF FRACTIONS.

¶ XLVI.

Exercises for the Slate. (p. 129.)

3. *A.* $48 \times 8 = 384 \div 3 = 128$ weeks.
4. *A.* $96 \times 10 = 960 \div 1 = 960$ times.
7. *A.* $8\frac{1}{3} = \frac{25}{3}$; $300 \times 3 = 900 \div 25 = 36$.
8. *A.* $8\frac{2}{11} = \frac{90}{11}$; $620 \times 11 = 6820 \div 90 = 75\frac{70}{90} = 75\frac{7}{9}$.
9. *A.* $84 \times 320 = 26880 \div 168 = 160$.
10. *A.* $4\frac{1}{2} = \frac{9}{2}$; $92 \times 2 = 184 \div 9 = 20\frac{4}{9}$.
11. *A.* $2\frac{3}{4} = \frac{11}{4}$; $100 \times 4 = 400 \div 11 = 36\frac{4}{11}$.
12. *A.* $15\frac{7}{8} = \frac{127}{8}$; $86 \times 8 = 688 \div 127 = 5\frac{53}{127}$.
13. *A.* $5\frac{1}{2}$ yds. $= \frac{11}{2}$; $220 \times 2 = 440 \div 11 = 40$ rods.
14. *A.* $30\frac{1}{4}$ sq. yds. $= \frac{121}{4}$; $1210 \times 4 = 4840 \div 121 = 40$
15. *A.* $31\frac{1}{2}$ galls. $= \frac{63}{2}$; $1260 \times 2 = 2520 \div 63 = 40$.

¶ XLVII. TO DIVIDE ONE FRACTION BY ANOTHER.

More Exercises for the Slate. (p. 130, 131.)

2. *A.* $\frac{1}{5}$ inverted is $\frac{5}{1}$; $\frac{7}{8} \times \frac{5}{1} = \frac{35}{8} = 4\frac{3}{8}$ pecks.
3. *A.* $\frac{3}{7} \times \frac{14}{3} = \frac{42}{21} = 2$.
4. *A.* $\frac{6}{7} \times \frac{25}{1} = \frac{150}{7} = 21\frac{3}{7}$.
5. *A.* $1\frac{4}{5} = \frac{9}{5} \times \frac{11}{6} = \frac{99}{30} = 3\frac{9}{30} = 3\frac{3}{10}$.
6. *A.* $9\frac{1}{4} = \frac{37}{4}$; $\frac{1}{2} \times \frac{4}{8} = \frac{4}{16}$; $\frac{37}{4} \times \frac{16}{4} = \frac{592}{16} = 37$.
7. *A.* $\frac{1}{2} \times \frac{3}{1} = \frac{3}{2} = 1\frac{1}{2}$.
8. *A.* $\frac{29}{31} \times \frac{16}{5} = \frac{464}{155} = 2\frac{154}{155}$.
9. *A.* $\frac{9}{13} \times \frac{7}{2} = \frac{63}{26} = 2\frac{11}{26}$.

REDUCTION OF FRACTIONS.

¶ XLVIII.

More Exercises for the Slate. (p. 132.)

2. *A.* 1£. × 20 × 12 = 240 d.; 2 s. 6 d. = 30 d.; $\frac{30}{240} = \frac{1}{8}$.

3. *A.* 1 cwt. × 4 × 28 × 16 = 1792; 3 qrs. 15 lbs. = 1598 oz.; $\frac{1598}{1792} \div 2 = \frac{799}{896}$.

4. *A.* 1 yd. = 16 na.; 3 qrs. 3 na. = 15 na.; $\frac{15}{16}$.

5. *A.* 1 bu. = 64 pts.; 3, 7, 1 = 63 pts.; $\frac{63}{64}$.

6. *A.* 1 tun × 2 × 2 × 63 × 4 × 2 × 4 = 8064; 1, 0, 2, 1 × 4 × 2 × 4 = 41 = $\frac{41}{8064}$.

7. *A.* 15 × 2 × 63 = 1890; $\frac{25}{1890} = \frac{5}{378}$.

8. *A.* 2 m. × 8 = 16 × 40 = 640 × 5½ = 3520 × 3 = 10560 × 12 = 126720 × 3 = 380160 denom.; 7 fur. 0 rods, 0 yds. 0 ft. 11 in. 2 b. c. × 40 = 280 × 5½ = 1540 × 3 = 4620 × 12 = 55451 × 3 = 166355 num.; $\frac{166355}{380160} \div 5 = \frac{33271}{76032}$.

9. *A.* 1 × 30 = 30; $\frac{18}{30}$.

10. *A.* 1 × 30 × 24 = 720; 25, 13 × 24 = 613; $\frac{613}{720}$.

11. *A.* 1 mo. × 30 = 30 × 24 = 720 × 60 = 43200 denom.; 22, 15, 1 × 24 = 543 × 60 = 32581 numer.; $\frac{32581}{43200}$.

¶ XLIX.

More Exercises for the Slate. (p. 133.)

2. *A.* 3 × 4 qrs. = 12 ÷ 4 = 3 qrs.

3. *A.* 1 × 4 roods = 4 ÷ 3 = 1 rood, and 1 rem.; 1 × 40 = 40 ÷ 3 = 13⅓ rds.

4. *A.* 20 × 12 = 240 ÷ 23 = 10, and 10 rem.; 10 × 20 pwts. = 200 ÷ 23 = 8 pwts. and 16 rem.; 16 × 24 = 384 ÷ 23 = 16$\frac{16}{23}$.

¶ L.

More Exercises for the Slate. (p. 134.)

2. *A.* $\frac{1}{240} \times 20\text{ s.} = \frac{20}{240} = \frac{1}{12}$.

3. *A.* $\frac{1}{1920} \times 20\text{ s.} \times 12\text{ d.} \times 4\text{ qrs.} = \frac{960}{1920} \div 960 = \frac{1}{2}$.

4. *A.* $\frac{1}{1008} \times 63 = \frac{63}{1008} \div 63 = \frac{1}{16}$.

5. *A.* $\frac{5}{171} \times 4\text{ pks.} \times 8\text{ qts.} = \frac{160}{171}$.

6. *A.* $\frac{1}{1441} \times 24\text{ h.} \times 60\text{ m.} = \frac{1440}{1441}$.

7. *A.* $\frac{5}{1008} \times 4\text{ qrs.} \times 28\text{ lbs.} = \frac{560}{1008} \div 112 = \frac{5}{9}$.

8. *A.* $\frac{4}{2520} \times 63\text{ gals.} \times 4\text{ qts.} \times 2\text{ pts.} = \frac{2016}{2520} = \frac{4}{5}$.

9. *A.* $\frac{3}{180} \times 20 = \frac{60}{180} = \frac{1}{3}$.

¶ LI.

More Exercises for the Slate. (p. 135.)

2. *A.* $\frac{1}{12} \times 20 = \frac{1}{240}$£.

3. *A.* $\frac{1}{2} \times 4 \times 12 \times 20 = \frac{1}{1920}$£.

4. *A.* $\frac{1}{16} \times 63 = \frac{1}{1008}$.

5. *A.* $\frac{160}{171} \div 8\text{ qts.} \div 4\text{ pks.} = \frac{5}{171}$. (See XL.)

6. *A.* $\frac{1440}{1441} \div 60 \div 24 = \frac{1}{1441}$.

7. *A.* $\frac{5}{9} \times 28 \times 4 = \frac{5}{1008}$.

8. *A.* $\frac{4}{5} \times 2 \times 4 \times 63 = \frac{4}{2520} = \frac{1}{630}$

9. *A.* $\frac{1}{3} \times 20 = \frac{1}{60}$,

DECIMAL FRACTIONS.

¶ LII.

Exercises for the Slate. (p. 139.)

1. *A.* 45,5 = 45$\frac{5}{10}$ = 45$\frac{1}{2}$.
2. *A.* 9,25 = 9$\frac{25}{100}$; $\frac{25}{100}$ ÷ 25 = $\frac{1}{4}$, and 9 is 9$\frac{1}{4}$.

◆

ADDITION OF DECIMALS.

¶ LIII.

More Exercises for the Slate. (p. 141.)

(2.)	(3.)	(4.)	(5.)
2,5	14,5	255,2	62,4
23,265	15,25	37,25	72,2657
4,2657	16,75	0,75	50,2
A. 30,0307.	*A.* 46,5.	11,255	55,75
		A. 304,455.	*A.* 240,6157.

(6.)	(7.)	(8.)
40,2	427,2623	,6
28,37	2789,00065	245,37
42,5	42,000009	6,008
22,005	1,3	245,0075
29,0042	7567,126783	1,00089
A. 162,0792.	897,62	,006
	A. 11724,309742	427,00002
		4,5
		925,000062
		A. 2854,492472

(9.)
1,5
45,349
,16
A. 47,009.

◆

SUBTRACTION OF DECIMALS.

¶ LIV.

More Exercises for the Slate. (p. 142.)

(1.)	(2.)	(3.)
60,72	6,25	72,625
19,999	4,75	6,2678
A. 40,721.	*A.* 1,5.	*A.* 66,3572.

(4.)

,65	,65	,65
,125	,2	,45
,525	,45	,2
,65	,65	,65
,6	,12567	,26
,05	,52433	,39

,525
,45
,2
,05
,52433
,39
A. 2,13933.

(5.)
294,45
420,275
400,78
419,28
1,01
1,0001
A. 1536,7951.

MULTIPLICATION OF DECIMALS.

¶ LV.

More Exercises for the Slate. (p. 143.)

(5.)	(6.)	(7.)
20,475	,344	5,85
25,20	,258	6,525
13,230	,301	236,2995
18,9	,3913	,558
35484,75	,2365	69,075
55,125	*A.* 1,5308.	900,00045
3957,2438535		9,000045
A. 39574,9238535.		*A.* 1227,307995

◆

DIVISION OF DECIMALS

¶ LVI.

More Exercises for the Slate. (p. 146.)

(8.)	(9.)	(10
12,5	445,	1,05
25,	222,6	,12
50,	89,2	36,
150,	44,6	19,
A. 237,5.	27,	12,
	A. 828,4.	*A.* 68,17.

(11.)
64,25
32,125
128,5
257,
A. 481,875.

(12.)
1,32
,66
13,2
6,6
132,
66,
A. 219,78.

* * *

REDUCTION OF DECIMALS.

¶ LVII.

More Exercises for the Slate. (p. 148.)

(4.)
,05
,5
,75
,04
A. 1,34.

(5.)
,05
,25
,5
,175
,625
A. 1,6.

(6.)
,1111
,4444
,010101
,3333
A. ,898901.

¶ LVIII.

More Exercises for the Slate. (p. 150.)

(2.)
4)3,
12)6,75
20)7,5625
A. ,378125£.

(3.)
20)5,
A. ,25£.

(4.)
4)3,
12) ,75
20) ,0625
A. ,003125£.

(5.)
4) 3,
4) 2,75
A. ,6875 yds.

(6.)
12) 3,
6) 2,25
A. ,375.

(7.)
4) 3,
4) 3,75
A. ,9375.

(8.)
20) 17,
12) 8,85
A. ,7375 lbs.

(10.)
4) 3,
12) 6,75
20) 17,5625
A. 8,878125 £.

¶ LIX.

More Exercises for the Slate. (p. 151.)

(2.)
378125
20
A. 7,562500
12
6,75....
4
3,00 *A.* 7 s. 6 d. 3 qrs.

(3.)
,25
20
5,00
A. 5 s.

(4.)
,003125
20
0,0625..
12
,75..
4
3,00 *A.* 3 qrs.

5. *A.* 2 qrs. 3 na.
6. *A.* 2 s. 3 d.
7. *A.* 3 qrs. 3 na.
8. *A.* 8 oz. 17 pwt.

Application of the two foregoing Rules. (p. 152.)

2. *A.* 2 cwt. 2 qrs. = ,25 × 6 = $15.

3. *A.* 15 cwt. 2 qrs., reduced to the decimal of a *ton,* by dividing by 4 and by 20, makes 7,75 × 20 = $15,50.

4. *A.* 6 cwt. 0 qr. 7 lbs. = 6,0625 cwt. × 11,25 = $68,203+.

5. *A.* 60 gals. 0 qts. 1 pt. = 60,125 gals. × ,78 = $46,897$\frac{5}{10}$.

6. *A.* 36 bu. 0 pk. 4 qts. = 36,125 bu. × 1,25 = $45,156$\frac{25}{100}$.

7. *A.* 26 yds. 2 qrs. = 26,5 yds. × 4,75 = $125,87½.

9. *A.* 6 gals. 2 qts. = 6,5 gals. × 15 s. = 97,5 shillings; then 97 s. ÷ 20 = 4£. 17 s., and the ,5 s. × 12 d. = 6 d.

REDUCTION OF CURRENCIES.

¶ LX.

New England Currency. (p. 156.)

3. *A.* 17£. 15 s. 6 d. = 17,775£. ÷ ,3 = $59,25.

(4.)

$ 59,25 × ,3 × 20 × 12 = 17£. 15 s. 6 d.
$177,75 × ,3 × 20 × 12 = 53£. 6 s. 6 d.
$355,50 × ,3 × 20 = 106£. 13 s. 0 d.
$ 71,00 × ,3 × 20 = 21£. 6 s. 0 d.
$142,00 × ,3 × 20 = 42£. 12 s. 0 d.
$568,00 × ,3 × 20 = 170£. 8 s. 0 d.

A. 412£. 1 s. 0 d.

(5.)

6£. 16 s. = 6,8£. × 15 = 102 ÷ ,3 = $340,00
7£. 10 s. = 7,5£. × 15 = 112,5 ÷ ,3 = $375,00
7£. 7 s. = 7,35£. × 15 = 110,25 ÷ ,3 = $367,50
6£. 10 s. 6 d. = 6,525£. × 15 = 97,875 ÷ ,3 = $326,25
6£. 4 s. 6 d. = 6,225£. × 15 = 93,375 ÷ ,3 = $311,25

A. $1720,00

(6.)

$\$50 \times 4 \times ,3 = 60\pounds.$
$\$49 \times 4 \times ,3 \times 20 = 58\pounds.\ 16\text{ s.}$
$\$48 \times 4 \times ,3 \times 20 = 57\pounds.\ 12\text{ s.}$
$\$25 \times 4 \times ,3 = 30\pounds.$
$\$12 \times 4 \times ,3 \times 20 = 14\pounds.\ 8\text{ s.}$
$\$24,50 \times 4 \times ,3 \times 20 = 29\pounds.\ 8\text{ s.}$

A. 250£. 4 s.

(7.)

$15\pounds. \ldots\ldots\ldots\ldots \times 4 = 60, \div ,3 = \$200,00$
$14\pounds.\ 14\text{ s.} = 14,7\pounds. \times 4 = 58,8 \div ,3 = \$196,00$
$14\pounds.\ 8\text{ s.} = 14,4\pounds. \times 4 = 57,6 \div ,3 = \$192,00$
$14\pounds.\ 4\text{ s.} = 14,2\pounds. \times 4 = 56,8 \div ,3 = \$189,333+$
$3\pounds.\ 12\text{ s.} = 3,6\pounds. \times 4 = 14,4 \div ,3 = \$\ 48,00$
$7\pounds.\ 4\text{ s.} = 7,2\pounds. \times 4 = 28,8 \div ,3 = \$\ 96,00$

A. $921,333.

(8.)

$\$22,75 \times 15 \times 341,25 \times ,3 \times 20 \times 12 = 102\pounds.\ 7\text{ s.}\ 6\text{ d.}$
$\$23,75 \times 15 \times 356,25 \times ,3 \times 20 \times 12 = 106\pounds.\ 17\text{ s.}\ 6\text{ d.}$
$\$20,75 \times 15 \times 311,25 \times ,3 \times 20 \times 12 = 93\pounds.\ 7\text{ s.}\ 6\text{ d.}$

A. 302£. 12 s. 6 d.

(9.)

$300\pounds.\ 15\text{ s.}\ 6\text{ d.} = 300,775\pounds. \div 3 = \$1002,583$
$61\pounds.\ 5\text{ s.}\ 6\text{ d.} = 61,275\pounds. \div 3 = \$\ 204,25$
$109\pounds.\ 9\text{ s.}\ 8\text{ d.} = 109,4833\pounds. \div 3 = \$\ 364,944+$

A. $1571,777

New York Currency. (p. 156.)

(2.)

409£. 16 s. = 409,8£. ÷ ,4 = $1024,50
136£. 12 s. = 136,6£. ÷ ,4 = $ 341,50
413£. 16 s. = 413,8£. ÷ ,4 = $1034,50
49£. 12 s. = 49,6£. ÷ ,4 = $ 124,00
50£. 2 s. = 50,1£. ÷ ,4 = $ 125,25
600£. = 1500£. ÷ ,4 = $1500,00
A. $4149,75.

(3.)

$22,078 × ,4 = 8,8312 × 20 × 12 × 4 = 8£. 16 s. 7 d. 1 qr.
$44,154 × ,4 = 17,6616 × 20 × 12 × 4 = 17£. 13 s. 2 d. 3 qrs.
$88,312 × ,4 = 35,3248 × 20 × 12 × 4 = 35£. 6 s. 5 d. 3 qrs.
$176,624 × ,4 = 70,6496 × 20 × 12 × 4 = 70£. 12 s. 11 d. 3 qrs.
A. 132£. 9 s. 3 d. 2 qrs.

(4.)

15 s. 6 d. = ,775£. × 20 = 15,500 ÷ 4 = $38,75
12 s. 6 d. = ,625£. × 20 = 12,500 ÷ 4 = $31,25
13 s. 6 d. = ,675£. × 20 = 13,500 ÷ 4 = $33,75
17 s. 6 d. = ,875£. × 20 = 17,500 ÷ 4 = $43,75
A. $147,50.

Pennsylvania Currency. (p. 157.)

(3.)

80£. .... × 8 = 640 ÷ 3 = $213,333+
250£. 16 s. 0 d. = 250,8£. × 8 = 2006,4 ÷ 3 = $668,80
240£. .... × 8 = 1920 ÷ 3 = $640,00
1£. 15 s. 7 d. = 1,77916£. × 8 = 14,233 ÷ 3 = $ 4,744
50£. 7 s. 2 d. = 50,3583£. × 8 = 402,866 ÷ 3 = $134,288
A. $1661,165+

(4.)

$9,50 × 3 = 28,50 ÷ 8 = 3,5625 = 3£. 11 s. 3 d.
$28,50 × 3 = 85,50 ÷ 8 = 10,6875 = 10£. 13 s. 9 d.
$57, × 3 = 171, ÷ 8 = 21,375 = 21£. 7 s. 6 d.
$85,50 × 3 = 256,50 ÷ 8 = 32,0625 = 32£. 1 s. 3 d.
$42,25 × 3 = 126,75 ÷ 8 = 15,84375 = 15£. 16 s. 10½ d.
$126,75 × 3 = 380,25 ÷ 8 = 47,53125 = 47£. 10 s. 7½ d.
$633,75 × 3 = 1901,25 ÷ 8 = 237,65625 = 237£. 13 s. 1½ d.
A. 368£. 14 s. 4½ d

GEORGIA CURRENCY. (p. 158.)

(3.)

208,8625£. × 30 = 6265,875 ÷ 7 = $895,125
104,43125£. × 30 = 3132,9375 ÷ 7 = $447,562
252,15625£. × 30 = 7564,687 + ÷ 7 = $1080,669
A. $2423,356.

(4.)

$447,562 × 7 ÷ 30 = 104,43113 = 104£. 8 s. 7¼ d.
$895,125 × 7 ÷ 30 = 208,8625 = 208£. 17 s. 3 d.
$1080,669 × 7 ÷ 30 = 252,1561 = 252£. 3 s. 1¼ d.
A. 565£. 8 s. 11½ d. +

ENGLISH OR STERLING MONEY. (p. 159.)

2. *A.* $95 × 9 ÷ 40 = 21,375 = 21£. 7 s. 6 d.
3. *A.* 21,375£. × 40 ÷ 9 = $95.
4. *A.* $285 × 9 ÷ 40 = 64,125£. = 64£. 2 s. 6 d.

CANADA CURRENCY. (p. 159.)

2. *A.* $12,50 × 120 = $1500 ÷ 4 = 375£. — 300£. = 75£.
3. *A.* 300 × 275 × 10¼ = $8456,25 ÷ 4 = 2114£. 1 s. 3 d.

FOREIGN COINS. (p. 160.)

2. *A.* \$92,50 ÷ $18\frac{1}{2}$, or ,185, = 500 livres.
3. *A.* 5000 × $18\frac{3}{4}$, or ,1875, = \$937,50.
4. *A.* 12500 × 40 = \$5000.
5. *A.* \$5000 ÷ 40 = 12500 florins.

Questions on the Foregoing. (p. 160—163.)

1. How many are 40, 5, and 9, added together? *A.* 54.
How many, 100 + 19 + 9? *A.* 128.
How many, 400 + 50 + 25 + 9? *A.* 484.
How many, 500 + 100 + 80 + 20? *A.* 700.
How many, 89 + 9 + 8 + 6? *A.* 112.
2. How many are 6 times 50? *A.* 300.
10 × 100? *A.* 1000.
10 × 1000? *A.* 10000.
20 × 60? *A.* 1200.
30 × 40? *A.* 1200.
3. What number added to 20 will make 30? *A.* 10.
Will make 40? *A.* 20.
Will make 39? *A.* 19.
Will make 89? *A.* 69.
4. What number multiplied by 4 will make 8? *A.* 2.
Will make 40? *A.* 10.
Will make 400? *A.* 100.
Will make 600? *A.* 150.
Will make 1000? *A.* 250.
5. What number divided by 8 will make 2? *A.* 2×8=16.
Will make 6? *A.* 6 × 8 = 48.
Will make 10? *A.* 8 × 10 = 80.

6. If the minuend be 40, and the subtrahend 21, what will be the remainder? *A.* 40 — 21 = 19.

7. If the remainder be 40, and the subtrahend 20, what will be the minuend? *A.* 20 + 40 = 60.

8. If the divisor be 6, and the quotient 8, what will the *dividend be?* *A.* 6 × 8 = 48.

9. If the quotient be 10, and the dividend 120, what will the divisor be? *A.* $120 \div 10 = 12$.

10. If the product of two numbers be 84, and the multiplicand 7, what will the multiplier be? *A.* $84 \div 7 = 12$.

11. What will 120 yards of cloth cost, at 50 cts. a yard? *A.* $120 \div 2 = \$60$.

At $33\frac{1}{3}$ cents? *A.* $120 \div 3 = \$40$.
At 25 cents? *A.* $120 \div 4 = \$30$.
At 20 cents? *A.* $120 \div 5 = \$25$.
At $16\frac{2}{3}$ cents? *A.* $120 \div 6 = \$20$.
At $12\frac{1}{2}$ cents? *A.* $120 \div 8 = \$15$.
At 10 cents? *A.* $120 \div 10 = \$12$.
At 5 cents? *A.* $120 \div 20 = \$6$.

12. How many times will a little wheel, 6 inches in circumference, turn round in going 1 foot, or 12 inches? *A.* $12 \div 6 = 2$.

In going 3 feet, or 36 inches? *A.* $36 \div 6 = 6$.
In going 5 feet? *A.* $5 \times 12 = 60 \div 6 = 10$.
12 feet? *A.* $12 \times 12 = 144 \div 6 = 24$.
How many times, in going across the street, allowing it to be 3 rods, 3 yards, and 1 foot, or 660 inches? *A.* $660 \div 6 = 110$.

13. What must be the circumference of a wheel that turns round twice in going 2 feet, or 24 inches? *A.* $24 \div 2 = 12$ in. or 1 foot.

14. How many shillings in 8 d. + 6 d. + 10 d? *A.* 24 d. = 2 s.

15. How much does 19 s. 6 d. lack of 1£.? *A.* 6 d.; for another 6 d. makes 12 d., or 1 s. Then 19 s. + 1 s. = 20 s.

16. How many pounds are 2 times 30 s.? *A.* £3.
4 × 10 s.? *A.* £2.

17. Divide 15 s. by 2. *A.* 2 in 15 = 7 s. and 1 s. left, which is 12 d. ÷ 2 = 6 d.

18. Reduce $\frac{4}{8}$ to its lowest terms. *A.* $\frac{4}{8} \div 4 = \frac{1}{2}$.

19. Reduce $\frac{6}{12}$, $\frac{9}{12}$, $\frac{50}{100}$, $\frac{20}{100}$, to their lowest terms. *A.* $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{5}$.

20. What fraction can you use for $\frac{7}{14}$, $\frac{8}{16}$, $\frac{9}{12}$, $\frac{2}{6}$, $\frac{4}{20}$? *A.* $\frac{1}{2}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{1}{5}$.

21. What part of a month is 1 day? *A.* $\frac{1}{30}$.
Is 2 days? *A.* $\frac{2}{30}$, $=\frac{1}{15}$.
Is 5 days? *A.* $\frac{5}{30}=\frac{1}{6}$.
Is 7 days? *A.* $\frac{7}{30}$.
Is 8 days? *A.* $\frac{8}{30}=\frac{4}{15}$.
Is 9 days? *A.* $\frac{9}{30}=\frac{3}{10}$.
Is 15 days? *A.* $\frac{15}{30}=\frac{1}{2}$.
Is 20 days? *A.* $\frac{20}{30}=\frac{2}{3}$.

22. How much is $\frac{1}{2}$ of $\frac{1}{2}$? *A.* $\frac{1}{2}$ of half an apple is $\frac{1}{4}$. $\frac{1\times1}{2\times2}=\frac{1}{4}$.
$\frac{1}{2}$ of $\frac{1}{4}$? *A.* $\frac{1\times1}{2\times4}=\frac{1}{8}$.
$\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{1}{4}$? *A.* $\frac{1\times1\times1}{2\times3\times4}=\frac{1}{24}$.

23. How much is $\frac{5}{6}$ of $\frac{7}{8}$? *A.* $\frac{35}{48}$.
$\frac{1}{20}$ of $\frac{4}{12}$? *A.* $\frac{4}{240}$.

24. How many times is 2 contained in $\frac{2}{3}$? *A.* 2 thirds of an apple divided among 2 boys is 1 third of an apple apiece. $\frac{2}{3}\div2=\frac{1}{3}$.
How much is $\frac{1}{2}$ of $\frac{2}{3}$? *A.* $\frac{1}{2}\times\frac{2}{3}=\frac{2}{6}=\frac{1}{3}$.

25. How many times 2 in $\frac{4}{15}$? (*To divide a fraction, we multiply the denominator, or divide the numerator.*) *A.* $\frac{4\div2}{15}=\frac{2}{15}$; or, $\frac{4\times2}{15}=\frac{4}{30}\div2=\frac{2}{15}$.
2 in $\frac{1}{15}$? *A.* $\frac{1}{30}$.
3 in $\frac{6}{11}$? *A.* $\frac{2}{11}$.
3 in $\frac{12}{11}$? *A.* $\frac{4}{11}$.
4 in $\frac{20}{21}$? *A.* $\frac{5}{21}$.

26. How much is $\frac{1}{2}$ of $\frac{1}{30}$ of a month? *A.* $\frac{1}{60}$.
$\frac{1}{2}$ of $\frac{1}{2}$ of a month? *A.* $\frac{1}{4}$.
$\frac{2}{3}$ of a month divided by 2 is how much? *A.* $\frac{1}{3}$.
How much is $\frac{1}{2}$ of $\frac{20}{30}$ of a month? *A.* $\frac{20}{30}\div2=\frac{10}{30}$.

27. James has $\frac{1}{8}$ of a dollar, Rufus $\frac{3}{8}$, and Thomas the remainder of the dollar; what is Thomas's part? *A.* $\frac{1}{8}+\frac{3}{8}=\frac{4}{8}$; then $\frac{4}{8}$ from $\frac{8}{8}$, the whole, leaves $\frac{4}{8}$, the answer.

28. *William had* $\frac{1}{8}$ of a ticket, Henry $\frac{1}{4}$, and James $\frac{1}{8}$?

what part of a ticket did they all own? *A.* These fractions cannot be added as they stand; but if we bring the $\frac{1}{4}$ into 8ths, by multiplying it by 2 (thus, $\frac{1}{4} \times 2 = \frac{2}{8}$), and the $\frac{1}{2}$ into 8ths, by multiplying it by 4 (thus, $\frac{1}{2} \times 4 = \frac{4}{8}$), we make the denominators alike, or, in other words, a common denominator, 8. By adding these 8ths (thus, $\frac{1}{8} + \frac{2}{8} + \frac{4}{8}$) we have $\frac{7}{8}$, the answer.

29. What kind of fractions are the following, viz.
$\frac{1}{2}$? *A.* A proper fraction.
$\frac{3}{4}$? *A.* A common or proper fraction.
$5\frac{1}{2}$, $7\frac{1}{8}$, $2\frac{6}{4}$? *A.* A mixed number.
$\frac{3}{4}$ of $\frac{1}{7}$? *A.* A compound fraction.

30. Reduce $\frac{1}{2}$ to a decimal. *A.* Annexing one cipher to the numerator, 1, brings it into 10ths, which divided by 5, the denominator, gives us 5 tenths, or, written decimally, thus, ,5, the answer.

31. What decimal is equal to $\frac{1}{2}$? *A.* 1,0 ÷ 2 = ,5.
$\frac{1}{4}$? *A.* 1,00 ÷ 4 = ,25.
$\frac{6}{12}$? *A.* 6,0 ÷ 12 = ,5.
$\frac{3}{4}$? *A.* 3,00 ÷ 4 = ,75.

32. James has ,2 [2 tenths] of a ticket, William ,5, Thomas ,2, and Harry the remainder; how much does Harry have? *A.* ,2 + ,5 + ,2 = ,9, or $\frac{9}{10}$; then $\frac{9}{10}$ from $\frac{10}{10}$, the whole, or ,9 from 1 whole, leaves ,1 for Harry's part, the answer.

33. What is the amount of ,3 + ,4 + ,1? *A.* ,8.

34. Multiply ,6 by ,5. *A.* ,5 × ,6 = ,30. We point off both the 0 and the 3, in 30, because there is one decimal in the multiplier, and one in the multiplicand, which make two in all. Now, as ,30, or $\frac{30}{100}$, = ,3, or $\frac{3}{10}$, reduced *down*, we reject the cipher at the right of ,30, leaving ,3 for the answer.

35. How much is ,5 of ,5? *A.* ,5 × ,5, = ,25.

36. How much is ,3 multiplied by ,4? *A.* ,12.

37. Divide ,24 by ,6. *A.* ,24 ÷ ,6 = ,4. We call the 4, 4 tenths, because we have only one decimal in the divisor, and therefore want another in the quotient, to make as many decimals as there are in ,24, which, you perceive, are two

38. Divide ,8 by ,2. *A.* ,8 ÷ ,2 = 4, a whole number, because the divisor alone has as many decimals as the dividend.

39. Divide ,6 by ,15. *A.* Annexing one cipher to ,6, makes ,60, which contains as many decimals as ,15; the quotient 4, then, will be a whole number.

40. From ,5 take ,25; that is, from ,50 take ,25. *A.* ,25.

41. $\frac{1}{7}$ of 14 is 2; 2, then, is $\frac{1}{7}$ of what number? *A.* $2 \times 7 = 14$.

42. $\frac{1}{2}$ of 4 is 2; 2, then, is $\frac{1}{2}$ of what number? *A.* $2 \times 2 = 4$.

43. 3 is $\frac{1}{4}$ of what number? *A.* $3 \times 4 = 12$.

44. 4 is $\frac{1}{5}$ of what number? *A.* $4 \times 5 = 20$.

45. 5 is $\frac{1}{10}$ of what number? *A.* $5 \times 10 = 50$.

46. 10 is $\frac{1}{2}$ of what number? *A.* $10 \times 2 = 20$.

47. 7 is $\frac{1}{5}$ of what number? *A.* $7 \times 5 = 35$.

Exercises for the Slate. (p. 162, 163.)

(3.)

$$\begin{array}{rr}
 & 7236845 \\
 & 1732 \\
\hline
 & 14473690 \\
 & 21710535 \\
 & 50657915 \\
 & 7236845 \\
\hline
A. & 12534215540. \\
\hline
\end{array}$$

6. *A.* $7 \times 70 = 49$.

10. *A.* $16 \times 2 \div 3 = 10\frac{2}{3}$.

11. *A.* $16 \times 3 \div 2 = 24$.

12. *A.* $30 \times 5 \div 6 = 25$.

13. *A.* $\frac{30}{1}$ inverted $= \frac{1 \times 5}{30 \times 6} = \frac{5}{180} = \frac{1}{36}$.

14. *A.* $\frac{1\times}{2\times}$ of $\frac{3}{4} = \frac{3}{8} \times 15 = \frac{45}{8} = 5\frac{5}{8}$.

15. *A.* $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8} \times \frac{1}{15} = \frac{3}{120} = \frac{1}{40}$

(16.)

A. $\frac{3}{5}$, $\frac{3}{7}$, $\frac{3}{4}$, $\frac{4}{9}$, reduced to a common denominator, $= \frac{756}{1260} + \frac{540}{1260} + \frac{945}{1260} + \frac{560}{1260} = \frac{2801}{1260} = 2\frac{281}{1260} + 76 + 63 + 79 + 59 = 279\frac{281}{1260}$.

(17.)
3700,05
0,65
6,0
37,5
0,000005
A. 3744,200005.

18. A. ,990625 × 20 × 12 × 4 = 19 s. 9¾ d.

(19.)
29yrs, 5m. 3d. 0h. 0m.
0yrs. 0m. 0d. 23h. 40m.
A. 29yrs. 5m. 2d. 0h. 20m.

(21.)
1828 yrs. 3 mo. 16 da.
1827 yrs. 4 mo. 14 da.
A. 11 mo. 2 da.

(22.)
1828 yrs. 6 mo. 20 da.
1826 yrs. 7 mo. 1 da.
A. 1 yr. 11 mo. 19 da.

(23.)
1828 yrs. 12 mo. 1 da.
1820 yrs. 11 mo. 15 da.
A. 8 yrs. 0 mo. 16 da.

INTEREST.

¶ LXI.

Exercises for the Slate. (p. 165, 166.)

2. A. 2 yrs. 6 mo. = 30 ÷ 2 = 15; 400 × 15 = $60,00.
3. A. × 24½ = $122,50 + 500 = $622,50.

(4.)
× 15 = $ 11,25
× 15 = $ 37,50
× 15 = $120,00
× 15 = $ 14,25
× 15 = $ 97,50
A. $280,50.

(5.)
× 2 = $ 30,00
× 3 = $ 45,00
× 5 = $ 75,00
× 7 = $105,00
× 10 = $150,00
× 25 = $375,00
× 39 = $585,00
A. $1365,00.

(6.)

$\times 15 + 75 = \$\ 86,25$
$\times 15 + 250 = \$287,50$
$\times 15 + 800 = \$920,00$
$\times 15 + 95 = \$109,25$
$\times 15 + 650 = \$747,50$
A. $2150,50.

(7.)

$\times 30 + 615,75 = \$\ 800,475$
$\times 66\frac{1}{2} + 615,75 = \$1025,223$
$\times 43 + 615,75 = \$\ 880,522$
A. $2706,22+

(8.)

$\times 19 = \$1491,75$
$\times 20 = \$1530,00$
$\times 39 = \$2983,50$
$\times 13 = \$\ 994,50$
A. $6999,75.

(9.)

$\times 60\frac{1}{2} + \$7,50 = \$12,037$
$\times 13\frac{1}{2} + \$7,50 = \$\ 8,512$
$\times \frac{1}{2} + \$7,50 = \$\ 7,537$
$\times 5\frac{1}{2} + \$7,50 = \$\ 7,912$
$\times 9\frac{1}{2} + \$7,50 = \$\ 8,212$
A. $44,210.

¶ LXII.

Exercises for the Slate. (p. 167, 168.)

3. *A.* $\div 4 = \$6.$
4. *A.* $\div 6 = \$6.$
5. *A.* $\div 3 = \$2,42.$

(6.)

$\times \frac{1}{60} = \$\ ,20$
$\times \frac{1}{20} = \$\ ,60$
$\times \frac{1}{15} = \$\ ,80$
$\times \frac{1}{12} = \$1,00$
$\times \frac{1}{6} = \$2,00$
$\times \frac{1}{4} = \$3,00$
$\times \frac{1}{3} = \$4,00$
$\times \frac{25}{60} = \$5,00$
A. $16,60.

9. *A.* $\div 60 \times 29 = \$,87.$
10. *A.* $\times 14\frac{1}{3} = \$206,486.$
11. *A.* $\times 12\frac{1}{2}$ and $\frac{1}{12} =$
$4,605\ 5 + 36,60 = \$41,205\frac{5}{10}.$

(12.)

$\times 9\frac{1}{4} = \$27,75$
$\times 15\frac{1}{4} = \$45,75$
$\times 20\frac{1}{6} = \$60,50$
$\times 26\frac{1}{12} = \$78,25$
A. $212,25.

(13.)

$\times 12 \ldots\ldots = \$\ 72{,}06$
$\times 10 \ldots\ldots = \$\ 60{,}05$
$\times 16\frac{1}{60} \ldots = \$\ 96{,}18$
$\times 33\frac{1}{2}$ & $\frac{12}{60} = \$202{,}368$
$\times 50\frac{1}{15} = \$300{,}65$
A. $\$731{,}308.$

(14.)

$\times 6 = \$42{,}000$
$\times 3\frac{1}{4} = \$22{,}750$
$\times 2 = \$14{,}000$
$\times \frac{1}{3} = \$\ 2{,}333$
A. $\$81{,}083.$

(15.)

$\times \frac{1}{20} + 60000 + \$60030$
$\times \frac{8}{60} + 60000 + \$60080$
$\times \frac{9}{60} + 60000 + \$60090$
A. $\$180200.$

(16.)

$\times 1\frac{1}{60} = \$0{,}61$
$\times 1\frac{1}{30} = \$0{,}62$
$\times 1\frac{1}{20} = \$0{,}63$
A. $\$1{,}86.$

(17.)

$\times 1\frac{7}{60} = \$0{,}67$
$\times 1\frac{8}{60} = \$0{,}68$
$\times 1\frac{12}{60} = \$0{,}72$
A. $\$2{,}07.$

18. *A.* $\times 77\frac{1}{2}$ and $\frac{29}{60} = \$935{,}80.$

¶ LXIII. Rule. (p. 169, 170.)

(2.)

$\times 15 \times 1 \div 6 = \$\ 6$
$\times 15 \times 2 \div 6 = \$12$
$\times 15 \times 4 \div 6 = \$24$
$\times 15 \times 6 \times 6 = \$36$
$\times 15 \times 10 \div 6 = \$60$
$\times 15 \times 5\frac{1}{2} \div 6 = \$33$
A. $\$171.$

(3.)

$\times 19 \times 15 \div 6 = \$228{,}00$
$\times 19 \times 20 \div 6 = \$304{,}00$
$\times 19 \times 10\frac{3}{4} \div 6 = \$163{,}40$
$\times 19 \times 15\frac{1}{2} \div 6 = \$235{,}60$
$\times 19 \times 7 \div 6 = \$106{,}40$
A. $\$1037{,}40.$

(4.)

$\times 7\frac{1}{2} \times 2\frac{3}{4} \div 6 = \$20{,}625$
$\times 7\frac{1}{2} \times 3\frac{3}{4} \div 6 = \$28{,}125$
A. $\$48{,}75.$

(5.)

$\times 1 = \$\ 6{,}00$
$\times 2 = \$12{,}00$
$\times 4 = \$24{,}00$
A. $\$42{,}00.$

(6.)

$\times 18 + 500 = \$590$ for 3 yrs.
$\times 36 + 500 = \$680$ for 6 yrs.
$\times 24 + 500 = \$620$ for 4 yrs.
A. $1890.

(7.)

1827 yrs. 11 mo. 1 day.
1826 yrs. 6 mo. 1 day.
A. 1 yr. 5 mo. $= 17$ mo $\div 2 = 8\frac{1}{2}$

1826 yrs. 8 mo. 16 days.
1825 yrs. 4 mo. 1 day.
A. 1 yr. 4 mo. 15 da. $= 16\frac{1}{2}$ mo $\div 2 = 8\frac{1}{4}$.

1828 yrs. 8 mo. 19 days.
1825 yrs. 7 mo. 4 days.
A. 3 yrs. 1 mo. 15 da. $= 37\frac{1}{2}$ mo. $\div 2 = 18\frac{3}{4}$.

$\times 8\frac{1}{2} = \$\ 5{,}10$
$\times 8\frac{1}{4} = \$\ 4{,}95$
$\times 18\frac{3}{4} = \$11{,}25$
A. $21,30.

(8.) T. *stands for* time.

T. 20 da.; $16\frac{1}{2}$ mo.

$\times \frac{1}{3} = \$\ 1{,}00$
$\times 8\frac{1}{4} = \$24{,}75$
A. $25,75.

(9.)

T. 4 yrs. 2 mo.
A. $\times 25 + 180 = \$225$.

¶ LXIV. Rule. (p.170, 171.)

2. *A.* $\times 14 = 840 \times \frac{1}{6} + 840 =$ \$9,80.

3. *A.* $\times 9\frac{1}{6} = 11,055 \times \frac{1}{6} + 11,055 = 12,897\frac{5}{10} + 120,60$ $=$ \$133,497$\frac{5}{10}$.

(4.)

$\times 3\frac{1}{3} = 8,04 \times \frac{1}{6} + 8,04 = 9,38 + 241,20 =$ \$250,58

$\times \frac{1}{2}$ & $\frac{1}{60} = 1,246 \times \frac{1}{6} + 1,246 = 1,453 + 241,20 =$ \$242,653

$\times 8\frac{1}{12} = 19,497 \times \frac{1}{6} + 19,497 = 22,746 + 241,20 =$ \$263,946

$\times 15\frac{24}{60} = 37,185 \times \frac{1}{6} + 37,185 = 43,382 + 241,20 =$ \$284,582

A. \$1041,761+

¶ LXV. (p. 171.)

2. *A.* $\times 12\frac{1}{2} =$ \$150,037.

(3.)

$\times\ 2\frac{1}{2} +$ \$80,10 $=$ \$82,102

$\times\ 5 +$ \$80,10 $=$ \$84,105

$\times\ 10 +$ \$80,10 $=$ \$88,110

$\times\ 4\frac{1}{2} \times$ \$80,10 $=$ \$83,704

$19\frac{3}{4} \times$ \$80,10 $=$ \$95,919

A. \$433,94

¶ LXVI. Commission. (p. 171.)

(3.)

$\times 250 \times 2 =$ \$15,000

$\times 250 \times 2\frac{3}{4} =$ \$20,625

$\times 250 \times 5 =$ \$37,500

$\times 250 \times 6\frac{1}{2} =$ \$48,750

$\times 250 \times 7 =$ \$52,500

A. \$174,375

INSURANCE. (p. 172.)

1. *A.* × 15½ = $3875.

(2.)

× 20 = $520
× 30 = $780
× 18½ = $481
× 26½ = $689
A. $2470.

STOCK. (p. 172.)

(3.)

× 97 = $1164
× 112 = $1344
× 87½ = $1050
× 112½ = $1350
A. $4908.

LOSS AND GAIN. (p. 173.)

2. *A.* 50 × 90 = $45.
3. *A.* 50 × 120 = $60.
4. *A.* 125 × 80 = $1.
5. *A.* ÷ 400 × 125 = $10,93¾.

(6.)

× 15 × 120 = $0,18
× 15 × 125 = $0,1875
× 15 × 130 = $0,195
× 15 × 140 = $0,21
× 15 × 145 = $0,2175
× 15 × 150 = $0,225
× 15 × 165 = $0,2475
× 15 × 175 = $0,2625
× 15 × 190 = $0,285
× 15 × 200 = $0,30
A. $2,31.

(7.)

× 300 × 6¼ = $1875,00
3780 gals. × 1,12½ or 1⅛ } = $4252,50
189 gals. × 90 = $170,10
400 × 7½ = $300,00
40 × 1¼ = $50,00
$6647,60
× 1,50
A. = $9971,40.

¶ LXVII. TIME, RATE PER CENT. AND AMOUNT GIVEN, TO FIND THE PRINCIPAL. (p. 174.)

3. A. ÷1,07=$600.
4. A. ÷1,1525=$600.

7. A. ÷105=2000;
2100—2000=$100.

DISCOUNT. (p. 175.)

2. A. ÷1,11=$120.
4. A. ÷1,10; 660—600=$60.
5. A. × 10=$60.
6. A. ÷1,15; 460—400=$60.
7. A. ÷1,35=$1000.
8. A. ÷1,04=$500.
9. A. ÷1,03=$1800.
10. A. ÷1,025; 615—600=$15.
11. A. ÷1,05=$1200.
12. A. ÷1,06=1200.

(13.)

÷1,03= $50
÷1,02= $200
÷1,30= $10000
÷1,18= $8000
A. $18250.

(14.)

÷1,03 =$500,000
÷1,06 =$485,849
÷1,075=$479,069
÷1,10 =$468,181
÷1,24 =$415,322
A. $2348,421+

¶ LXVIII. TIME, RATE PER CENT. AND INTEREST BEING GIVEN, TO FIND THE PRINCIPAL. (p. 176.)

2. A. ÷,06=$80000, annexing two ciphers to 48000, to make the decimal places in the divisor and dividend equal, in which case the quotient will be a whole number.

3. A. ÷,06=$200000.
4. A. ÷,15=$300.

¶ LXIX. THE PRINCIPAL, INTEREST AND TIME, BEING GIVEN, TO FIND THE RATE PER CENT. (p. 176.)

2. *A.* 600 × 10 ÷ 6 = $10,00, the interest of the given sum at 1 per cent. for 1 yr. 8 mo. Then $60 ÷ 10 = $6, or 6 per cent.

3. *A.* $2000 × 15 ÷ 6 = $50,00; 200 ÷ 50 = 4 per cent.

WHEN THE PRICES OF GOODS ARE GIVEN, TO FIND WHAT IS THE RATE PER CENT. OF GAIN OR LOSS. (p. 177, 178.)

2. *A.* 30 — 24 = 6; then $\frac{6}{24}$ = ,25, that is, 25 per cent.
3. *A.* 75 — 60 = 15; then, $\frac{15}{75}$ = ,20, = 20 per cent.
4. *A.* $5 gain; $\frac{5}{20}$ = 25 per cent.
5. *A.* $1 gain; $\frac{1}{8}$ = 12½ per cent.
6. *A.* 19,11 loss; $\frac{1911}{31850}$ = ,06, or 6 per cent.

(7.)

42 — 40 = 2; $\frac{2}{40}$ = 5 per cent.
44 — 40 = 4; $\frac{4}{40}$ = 10 per cent.
46 — 40 = 6; $\frac{6}{40}$ = 15 per cent.
50 — 40 = 10; $\frac{10}{40}$ = 25 per cent.
54 — 40 = 14; $\frac{14}{40}$ = 35 per cent.
60 — 40 = 20; $\frac{20}{40}$ = 50 per cent.
A. 140 per cent.

(8.)

112 × ,286 = 32,032
112 × ,26 = 29,12
2,912 gain.

,286 — 26 = ,026, or 26 mills placed under 26 cents, brought into mills, = $\frac{26}{260}$, = ,1, that is, ,10, which is 10 per cent., *Ans.*

9. *A.* 1,80 gain; 1,80 = 180 cents; $9 = 900 cents; $\frac{180}{900}$ = *20 per cent.*

10. *A.* $150 + 250 = 400$; $350 + 100 = 450 - 400 =$ \$50, gain on the whole; $\frac{50}{400}$ — ,125 = $12\frac{1}{2}$ per cent.

11. *A.* 15 mills gain; ,15 = 150 mills; $\frac{15}{150}$ = ,1, or ,10 which is 10 per cent., or \$10.

(12.)

$$\begin{array}{rcl}
20 \times 25{,}625 & = & \$512{,}50 \\
20 \times 20 = 400 & & \\
20 \div \ \ 2 = \underline{\ \ 10} & & \\
410 & = & \underline{\$410{,}00} \\
 & & \$102{,}50 \text{ gain.}
\end{array}$$

Then $\frac{10250}{41000}$ = 25 per cent., *Answer.*

¶ LXX. THE PRINCIPAL, RATE PER CENT. AND INTEREST BEING GIVEN, TO FIND THE TIME. (p.178.)

2. *A.* $600 \times 6 = 36{,}00 \div 36 = 1$ yr.

3. *A.* $\times 5 = 50{,}00$; $200 \div 50 = 4$ yrs.

4. *A.* $\times 6 = 3{,}60$; $9{,}18 \div 3{,}60 = 2{,}55 = 2$ yrs. 6 mo. 18 da.

COMPOUND INTEREST.

¶ LXXI (p. 180, 181.)

(3.)

500 × 6
= 30,00
+ 500
= 530 × 6
= 31,80
+ 530
= 561,80 × 6
= 33,7080
+ 561,80
= 595,508 × 6
= 35,7304
+ 595,508
A. $631,238$\frac{4}{10}$.

(4.)

A. ×24 = 120 + 500 = $620.

(6.)

A. ×30 = 210 + 700 = $910.

(5.)

700 × 6
= 42
+ 700
= 742 × 6
= 44,52
+ 742
= 786,52 × 6
= 47,1912
+ 786,52
= 833,7112 × 6
= 50,022672
+ 833,7112
= 883,733872 × 6
= 53,02403232
+ 883,733872
A. $936,75790432.

(7.)

1st. *For three years.*

1000 × 6
= 60,00
+ 1000
= 1060 × 6
= 63,60
+ 1060
= 1123,60 × 6
= 67,4160
+ 1123,60
= $1191,016

2d. *For six years.*

1500 × 6
= 90,00
+ 1500
= 1590 × 6
= 95,40
+ 1590
= 1685,40 × 6
= 101,1240
+ 1685,40
= 1786,524 × 6
= 107,19144
+ 1786,524
= 1893,71544 × 6
= 113,6229264
+ 1893,71544
= 2007,3383664 × 6
= 120,4403019
+ 2007,3383664
= $2127,778$\frac{6}{10}$ +

3d. *For two years.*

2000 × 6
= 120,00
+ 2000
= 2120 × 6
= 127,20
+ 2120
= $2247,20

4th. *For seven years.*

400 × 6
= 24,00
+ 400
= 424 × 6
= 25,44
+ 424
= 449,44 × 6
= 26,9664
+ 449,44
= 476,4064 × 6
= 28,584384
+ 476,4064
= 504,990784 × 6
= 30,29944704
+ 504,990784
= 535,29023104 × 6
= 32,1174138
+ 535,290231
= 567,4076448 × 6
= 34,044458688
+ 567,4076448
= $601,452 +

1st. $1191,016
2d. $2127,7786
3d. $2247,20
4th. $ 601,452
A. $6167,446$\frac{6}{10}$ +

(8.)

1st. *For two years*

150 × 6
= 9,00
+150
= 159 × 6
= 9,54
+159
= 168,54
—150
= $18,54

2d. *For four years.*

1600 × 6
= 96,00
+1600
= 1696 × 6
= 101,76
+1696
= 1797,76 × 6
= 107,8656
+1797,76
= 1905,6256 × 6
= 114,337536
+1905,6256
= 2019,9631
—1600
= $419,9631 +

3d. *For three years.*

1000 × 6
= 60,00
+1000
= 1060 × 6
= 63,60
+1060
= 1123,60 × 6
= 67,4160
+1123,60
= 1191,016
—1000
= $191,016

4th. *For four years.*

5680 × 6
= 340,80
+5680
= 6020,80 × 6
= 361,2480
+6020,80
= 6382,048 × 6
= 382,92288
+6382,048
= 6764,97088 × 6
= 405,8982528
+6764,97088
= 7170,8691
—5680
= $1490,869

5th. *For three years.*

500 × 6
= 30,00
+ 500
= 530 × 6
= 31,80
+ 530
= 561,80 × 6
= 33,7080
+ 561,80
= 595,508
— 500
= $95,508

1st. $ 18,54
2d. $419,9631
3d. $191,016
4th. $1490,869
5th. $ 95,508
A, $2215,8961 +

(9.)

1st. *For 2 per cent.*

600,50 × 2
= 12,0100
+ 600,50
= 612,51 × 2
= 12,2502
+ 612,51
= 624,7602
— 600,50
= $24,2602

2d. *For 3 per cent.*

600,50 × 3
= 18,0150
+ 600,50
= 618,515 × 3
= 18,55545
+ 618,515
= 637,07045
— 600,50
= $36,5704 +

3d. *For 4 per cent.*

600,50 × 4
= 24,0200
+ 600,50
= 624,52 × 4
= 24,9808
+ 624,52
= 649,5008
— 600,50
= $49,0008

4th. *For 5 per cent.*

600,50 × 5
= 30,0250
+ 600,50
= 630,525 × 5
= 31,52625
+ 630,525
= 662,05125
— 600,50
= $61,5512 +

5th. *For* 7 *per cent.*

600,50 × 7
= 42,0350
+600,50
= 642,535 × 7
= 44,97745
+642,535
= 687,51245
—600,50
= $87,0124

6th. *For* 10 *per cent.*

600,50 × 10
= 60,0500
+600,50
= 660,55 × 10
= 66,0550
+660,55
= 726,605
—600,50
= $126,105

1st.	$24,2602
2d.	$36,5704
3d.	$49,0008
4th.	$61,5512
5th.	$87,0124
6th.	$126,105
A.	$384,50.

(10.)

200 × 18 = $36, S. interest.

200 × 6
= 12,00
+200
= 212 × 6
= 12,72
+212
= 224,72 × 6
= 13,4832
+224,72
= 238,2032
—200
= $38,2032
—$36, S. interest.
A. $2,2032.

(11.)

600 × 6
= 36,00
+600
= 636 × 6
= 38,16
+636
= 674,16 × 3
= 20,2248
+674,16
= 694,3848
—600
A. $94,384+

(12.)
500 × 6
= 30,00
+ 500
= 530 × 6
= 31,80
+ 530
= 561,80 × 6
= 33,7080
+ 561,80
= 595,508 × 2
= 11,91016
+ 595,508
= 607,41816
— 500
A. $107,4181 +

(13.)
1st. *For three years.*
200 × 18 = $36, S. interest.
200 × 6
= 12,00
+ 200
= 212 × 6
= 12,72
+ 212
= 224,72 × 6
= 13,4832
+ 224,72
= 238,2032
— 200
= 38,2032
— 36
= $2,2032

2d. *For 4 yrs. 6 mo.*
200 × 27 = $54, S. interest.
200 × 6
= 12,00
+ 200
= 212 × 6
= 12,72
+ 212
= 224,72 × 6
= 13,4832
+ 224,72
= 238,2032 × 6
= 14,292192
+ 238,2032
= 252,495392 × 3
= 7,57486176
+ 252,495392
= 260,07025376
— 200, S. interest.
$60,0702 +
— 54
= $6,0702 +

3d. *For 2 yrs. 8 mo. 15 da.*

$200 \times 16\frac{1}{4} = \$32,50$, S. interest.

$$\begin{array}{l} \underline{\quad 200 \times 6} \\ = 12,00 \\ \underline{+200} \\ \underline{= 212 \times 6} \\ = 12,72 \\ \underline{+212} \\ \underline{= 224,72 \times 4\frac{1}{4}} \\ = 9,5506 \\ \underline{+224,72} \\ = 234,2706 \\ \underline{-200} \\ \quad \$34,2706 \\ \quad \underline{\$32,50,} \text{ S. interest.} \\ \quad \underline{\$1,7706} \end{array}$$

1st. $2,2032
2d. $6,0702
3d. $1,7706
A. $10,044.

(15.)

2 yrs. $10,50 \times 1,1025 = \$11,5762$
6 yrs. $10,50 \times 1,34009 = \$14,0709$
8 yrs. $10,50 \times 1,47745 = \$15,5132$
15 yrs. $10,50 \times 2,07892 = \$21,8286$
17 yrs. $10,50 \times 2,29201 = \$24,0661$
20 yrs. $10,50 \times 2,65329 = \$27,8595$
A. $\$114,914\frac{5}{10}$.

EQUATION OF PAYMENTS.

¶ LXXII. (p. 182, 183.)

2. *A.* $5 \times 12 = 60$ mo.
3. *A.* $10 \times 20 = 200$ mo.

(5.)

$200 \times 6 = 1200$
$300 \times 12 = 3600$
$500 \times 3 = 1500$
$1000 \ldots\ldots)\ 6300$
A. $6\frac{300}{1000} = 6\frac{3}{10}$.

(6.)

$500 \times 3 = 1500$
$360 \times 5 = 1800$
$600 \times 8 = 4800$
$540 \times 9 = 4860$
$2000 \ldots)\ 12960$
A. $6\frac{960}{2000} = 6\frac{12}{25}$ mo.

(7.)

$100 \times 2 = 200$
$200 \times 5 = 1000$
$300 \times 8 = 2400$
$600 \ldots\ldots)\ 3600$
A. 6 mo.

(8.)

$1200 \times 4 = 4800$
$700 \times 10 = 7000$
$650 \times 24 = 15600$
$1000 \times 42 = 42000$
$1270 \times 20 = 25400$
$500 \times 48 = 24000$
$5320 \ldots\ldots)\ 118800$
A. $22\frac{1760}{5320}$.

Questions on the foregoing. (p. 183, 184.)

(2.)

$\div\ 2 = \$4800$
$\div\ 3 = \$3200$
$\div\ 4 = \$2400$
$\div\ 5 = \$1920$
$\div\ 6 = \$1600$
$\div\ 8 = \$1200$
$\div 16 = \$\ \ 600$
$\div 20 = \$\ \ 480$
A. $16200.

(3.)

$\times\ 2 = 0\pounds.\ \ 5\text{ s. } 0\text{ d.}$
$\times\ 4 = 0\pounds.\ 10\text{ s. } 0\text{ d.}$
$\times\ 7 = 0\pounds.\ 17\text{ s. } 6\text{ d.}$
$\times 10 = 1\pounds.\ \ 5\text{ s. } 0\text{ d.}$
$\times 12 = 1\pounds.\ 10\text{ s. } 0\text{ d.}$
A. 4£. 7 s. 6 d.

(5.)

$$\begin{array}{r|l} 4 & 8\,.\,4\,.\,5 \\ \hline & 2\,.\,1\,.\,5 \end{array}$$ See ¶ XLIII.

$4 \times 2 \times 1 \times 5 = 40$, least common denominator.

$$\left.\begin{array}{l} 40 \times \frac{7}{8} = 35; \\ 40 \times \frac{3}{4} = 30; \\ 40 \times \frac{1}{5} = \ \ 8; \end{array}\right\} \left.\begin{array}{l} \text{then } \frac{7}{8} = \frac{35}{40}, \\ \text{then } \frac{3}{4} = \frac{30}{40}, \\ \text{then } \frac{1}{5} = \frac{8}{40}, \end{array}\right\} A.$$

6. *A.* $2000 \times ,18\frac{3}{4} = \$375.$

(7.)

,025
,3
,050
673,0
,00005
A. 673,37505.

8. *A.* ×20×12=1080000; 4 s. 6 d. = 54 d.; 1080000 ÷ 54 = $20000.

(9.)

$\times 3\ \ = \$,636$
$\times 1\frac{3}{4} = \$,371$
$\times\ \frac{3}{4} = \$,159$
$\times\ \frac{1}{6} = \$,085 +$
$\times \frac{1}{12} = \$,017 +$
$\times \frac{1}{15} = \$,014 +$
A. $1,232 +

(10.)

$\times\ 7 + 300 = \$321$
$\times\ 3 + 300 = \$309$
$\times\ 5\frac{1}{2} + 300 = \$316,50$
$\times\ 9\frac{3}{4} + 300 = \$329,25$
$\times\ 12\frac{1}{2} + 300 = \$337,50$

A. $1613,25.

(11.)

$\div 1,05;\ 315 - 300 = \$\ 15,000$
$\div 1,10;\ 550 - 500 = \$\ 50,000$
$\div 1,33;\ 2660 - 2000 = \$660,000$
$\div 1,5025;\ 121,402 - 80800 = \$\ 40,602$

A. $765,602.

(12.)

1st. *For four years.*

560×6
$= 33,60$
$+ 560$
$= 593,60 \times 6$
$= 35,6160$
$+ 593,60$
$= 629,2160 \times 6$
$= 37,752960$
$+ 629,2160$
$= 666,968960 \times 6$
$= 40,01813760$
$+ 666,968960$
$= 706,98709760$
$- 560$
$= \$146,987 +$

2d. *For 2 years and 6 mo*

560×6
$= 33,60$
$+ 560$
$= 593,60 \times 6$
$= 35,6160$
$+ 593,60$
$= 629,2160 \times 3$
$= 18,876480$
$+ 629,2160$
$= 648,092480$
$- 560$
$= \$88,092.$

3d.

The amount by the first operation (which see) is 666,968960 — 560 = $106,968.

1st. $146,987
2d. $ 88,092
3d. $106,968
A. $342,047.

(13.)

A. 488,75 ÷ 115 = 425 — 368,925 = $56,075

(14.)

A. 72 — 60 = 12 gain; $\frac{12}{60}$ = ,2, or ,20, which is 20 per cent.

(15.)

A. 27 × 40 = 1080; 40 — 4 = 36; 1080 ÷ 36 = 30 cts.; 30 × 120 = 36.

RULE OF THREE,

OR

SIMPLE PROPORTION.

¶ LXXIII. (p. 186, 187.)

5. *A.* 4,25 ÷ 25 = 17 cents.

(6.)

4,50 ÷ 3 = $1,50 for 1 pair.

1,50 × 12 pair = $18,00
1,50 × 8 pair = $12,00
1,50 × 15 pair = $22,50
1,50 × 16 pair = $24,00
A. $76,50.

(7.)

,50 ÷ 2 = ,25 for 1 pair.
,25 × 3 pair = $ 0,75
,25 × 15 pair = $ 3,75
,25 × 25 pair = $ 6,25
,25 × 80 pair = $20,00
,25 × 96 pair = $24,00
,25 × 267 pair = $66,75
A. $121,50.

(8.)

600 × 84 = $504
10 × 84 = $ 8,40
40 × 84 = $ 33,60
800 × 84 = $672,00
1000 × 84 = $840,00
2 × 84 = $ 1,68
A. $2059,68.

(9.)

60 ÷ 4 = 15 cts. a pound.
,30 ÷ 15 = 2 pounds.
,90 ÷ 15 = 6 pounds.
1,20 ÷ 15 = 8 pounds.
2,10 ÷ 15 = 14 pounds.
2,40 ÷ 15 = 16 pounds.
A. 46 pounds.

(10.)

× 12 pair = $ 9,00
× 18 pair = $13,50
× 24 pair = $18,00
× 30 pair = $22,50
× 36 pair = $27,00
A. $90.

(11.)

27,00 ÷ 36 = 75 cts. a pair.
75 × 1 pair = $ 0,75
75 × 30 pair = $22,50
75 × 24 pair = $18,00
75 × 18 pair = $13,50
75 × 12 pair = $ 9,00
A. $63,75.

(12.)

25 ÷ 5 = 5 sheep eat 1 ton.
7 tons × 5 = 35 sheep.
8 tons × 5 = 40 sheep.
15 tons × 5 = 75 sheep.
60 tons × 5 = 300 sheep.
80 tons × 5 = 400 sheep.
A. $850 sheep.

(13.)

9,00 ÷ 2,25 = 4 weeks.
13,50 ÷ 2,25 = 6 weeks.
18,00 ÷ 2,25 = 8 weeks.
20,25 ÷ 2,25 = 9 weeks
49,50 ÷ 2,25 = 22 weeks.
A. 49 weeks.

(14.)

$50 \div 2 = \$25$ per month.
$12 \text{ months} \times 25 = \$\ 300$
$8 \text{ months} \times 25 = \$\ 200$
$16 \text{ months} \times 25 = \$\ 400$
$18 \text{ months} \times 25 = \$\ 450$
$24 \text{ months} \times 25 = \$\ 600$
$120 \text{ months} \times 25 = \$3000$
A. $\$4950.

(15.)

$6 \text{ pieces} \times 20 \times 150 = \$180$
$1 \text{ piece} \times 20 \times 150 = \$\ 30$
$3 \text{ pieces} \times 20 \times 150 = \$\ 90$
$5 \text{ pieces} \times 20 \times 150 = \$150$
$10 \text{ pieces} \times 20 \times 150 = \$300$
A. $\$750.

(16.)

$5 \text{ hhds.} \times 60 \times 2 = \$\ 600$
$4 \text{ hhds.} \times 60 \times 2 = \$\ 480$
$20 \text{ hhds.} \times 60 \times 2 = \$2400$
A. $\$3480.

(17.)

A. $365 \times 2{,}50 = 912{,}50$;
$1500 - 912{,}50 = \$587{,}50$.

(18.)

William's expenses are \$912,50 per annum. (See the last example.)

$2000 - 912{,}50 = \$1087{,}50$
$2500 - 912{,}50 = \$1587{,}50$
$3600 - 912{,}50 = \$2687{,}50$
$4000 - 912{,}50 = \$3087{,}50$
A. $\$8450.

(19.)

$20{,}16 \div 63 \text{ gallons} = \$0{,}32$
$20{,}16 \div 252 \text{ quarts} = \$0{,}08$
$20{,}16 \div 504 \text{ pints} = \$0{,}04$
$20{,}16 \div 2016 \text{ gills} = \$0{,}01$
A. $\$0{,}45$,

More Exercises for the Slate. (p. 194—196.)

(25.)

$600 \text{ bu.} : 3600 \text{ bu.} :: \$1200.$
$7200 \times 3600 = 4320000 \div 600 = \$7200$, *A.*

By Ratio

$3600 \div 600 = 6 \times 1200 = \$7200$, A.

(26.)

$1200 : $7200 : : 600 bu.
7200 × 600 = 4320000 ÷ 1200 = 3600 bushels, *A.*

By Ratio.

7200 ÷ 1200 = 6 × 600 = 3600 bushels, *A.*

(27.)

3600 bu. : 600 bu. : : $7200.
7200 × 600 = 4320000 ÷ 3600 = $1200, *A*

By Ratio.

600 ÷ 3600 = $\frac{600}{3600}$ = $\frac{1}{6}$ × 7200 = $1200, *A*

(28.)

52 wks. : 39 wks. : : $182.
182 × 39 = 7098 ÷ 52 = $136,50, *A.*

By Ratio.

39 ÷ 52 = $\frac{39}{52}$ = $\frac{3}{4}$ = 182 = $136,50, *A.*

(29.)

120 bu. : 600 bu. : : 30 bu. rye.
600 × 30 = 18000 ÷ 120 = 150 bushels, *A.*

By Ratio.

600 ÷ 120 = 5 × 30 = 150 bushels, *A.*

(30.)

17 qrs. : 85 qrs. : : $45,20.
45,20 × 85 = 3842,00 ÷ 17 = $226, *A.*

By Ratio.

85 ÷ 17 = 5 × 45,20 = $226, *A.*

(31.)

60 yds. : 1 yd. : : $120 : $2,00
240 qrs. : 3 qrs. : : $120 : $1,50
240 qrs. : 5 qrs. : : $120 : $2,50
240 qrs. : 6 qrs. : : $120 : $3,00
A. $9,00.

(32.)

8 pipes : 1 pipe : : $322,56 : $40,32
16 hhds. : 1 hhd. : : $322,56 : $20,16
1008 gals. : 42 gals. : : $322,56 : $13,44
1008 gals. : 31½ gals. : : $322,56 : $10,08
A. $84,00.

4032 qts. : 2 qts. : : $322,56 : $0,16
8064 pts. : 3 pts. : : $322,56 : $0,12
32256 gills : 4 gills : : $322,56 : } $0,04
or
8064 pts. : 1 pt. : : $322,56 : }
A. $0,32.

(33.)

12 pipes : 1 pipe : : $500,50 : $41,708 + *A.*

(34.)

$1,00 : $2500 : : $0,40 : $1000, A's, } *A.*
$1,00 : $1600 : : $0,40 : $640, B's, }

(35.)

$1600,60
$ 500,00
$ 750,20
$1000,00
$ 230,00
$4080,80 : $1,00 : : $1020,20 : $0,25, *A.*
$4080,80 — $3060,60 = $1020,20.

(36.)

112 lbs. : 3424 lbs. : : $9,35.
3424 × 9,35 = 3201440 ÷ 112 =............ $285,842+
28 lbs. : 3424 lbs. : : $2,50.
3424 × 2,50 = 8560,00 ÷ 28 =............. $305,714+
1 lb. : 3424 lbs. : : $0,10.
3424 × 10 =.............................. $342,40
A. $933,956+

(37.)

The cloth was sold by measure; therefore the 300 yds. has nothing to do with the operation.

1102 qrs. : 4 qrs. : : $450,60 : $ 1,635
1102 qrs. : 80 qrs. : : $450,60 : $32,711
1102 qrs. : 102 qrs. : : $450,60 : $41,707
4408 na. : 487 na. : : $450,60 : $49,782
A. $125,835+

(38.)

9 ft. : 198 ft. : : 6 ft. : 132 ft., *A.*
198 ÷ 9 = 22, ratio, × 6 = 132 ft., *A.*

(39.)

408 lbs. : 1224 lbs. : : \$51 : \$153
408 lbs. : 2448 lbs. : : \$51 : \$306
408 lbs. : 4896 lbs. : : \$51 : \$612

A. \$1071.

By Ratio.

1224 ÷ 408 = 3 × 51 = \$153
2448 ÷ 408 = 6 × 51 = \$306
4896 ÷ 408 = 12 × 51 = \$612

A. \$1071.

(40.)

\$100 : \$ 20 : : \$6 : \$ 1,20
\$100 : \$ 10 : : \$6 : \$ 0,60
\$100 : \$ 50 : : \$6 : \$ 3,00
\$100 : \$ 75 : : \$6 : \$ 4,50
\$100 : \$200 : : \$6 : \$12,00
\$100 : \$300 : : \$6 : \$18,00
\$100 : \$500 : : \$6 : \$30,00
\$100 : \$800 : : \$6 : \$48,00
\$100 : \$1000 : : \$6 : \$60,00
\$100 : \$1250 : : \$6 : \$75,00
\$100 : \$2000 : : \$6 : \$120,00

A. \$372,30.

By Ratio.

$20 \div 100 = \frac{1}{5} \times 6 = \$\ 1{,}20$
$10 \div 100 = \frac{1}{10} \times 6 = \$\ 0{,}60$
$50 \div 100 = \frac{1}{2} \times 6 = \$\ 3{,}00$
$75 \div 100 = \frac{3}{4} \times 6 = \$\ 4{,}50$
$200 \div 100 = 2 \times 6 = \$12{,}00$
$300 \div 100 = 3 \times 6 = \$18{,}00$
$500 \div 100 = 5 \times 6 = \$30{,}00$
$800 \div 100 = 8 \times 6 = \$48{,}00$
$1000 \div 100 = 10 \times 6 = \$60{,}00$
$1250 \div 100 = 12\frac{1}{2} \times 6 = \$75{,}00$
$2000 \div 100 = 20 \times 6 = \$120{,}00$
A. \$372,30.

(41.)

5 days : 20 days : : 12 men : 48 men, *A.*
$20 \div 5 = 4 \times 12 = 48$ men, *A.*

(42.)

20 days : 4 days : : 60 men : 12 men, *A.*
$4 \div 20 = \frac{1}{5} \times 60 = 12$ men, *A.*

(43.)

12 men : 4 men : : 120 days : 40 days.
16 men : 4 men : : 120 days : 30 days.
20 men : 4 men : : 120 days : 24 days.
24 men : 4 men : : 120 days : 20 days.
A. 114 days.

By Ratio.

$4 \div 12 = \frac{1}{3} \times 120 = 40$ days.
$4 \div 16 = \frac{1}{4} \times 120 = 30$ days.
$4 \div 20 = \frac{1}{5} \times 120 = 24$ days.
$4 \div 24 = \frac{1}{6} \times 120 = 20$ days.
A. 114 days.

(44.)

10 h. : 6 h. :: 30 days : 18 days, *A.*

(45.)

The same field will keep 5 cows a less number of days than 2 cows; therefore 2 is to be made the middle term, and 5 the first term.

5 cows : 2 cows :: 20 days : 8 days.
8 cows : 2 cows :: 20 days : 5 days.
10 cows : 2 cows :: 20 days : 4 days.
20 cows : 2 cows :: 20 days : 2 days.
A. 19 days.

(46.)

At $1,50 a bushel, it will take a less number of bushels to pay the same debt, than at $1 per bushel; therefore make the less number the second term, and the greater, the first term.

$1,50 : $1,00 :: 60 bu. : 40 bushels.
$1,20 : $1,00 :: 60 bu. : 50 bushels.
$0,80 : $1,00 :: 60 bu. : 75 bushels.
$0,50 : $1,00 :: 60 bu. : 120 bushels.
$0,40 : $1,00 :: 60 bu. : 150 bushels.
$0,30 : $1,00 :: 60 bu. : 200 bushels.
A. 635 bushels.

(47.)

6 in. : 12 in. :: 12 in length : 24 inches.
4 in. : 12 in. :: 12 in length : 36 inches.
8 in. : 12 in. :: 12 in length : 18 inches.
16 in. : 12 in. :: 12 in length : 9 inches.
A. 87 inches.

(48.)

$1750,50 — $400 = $1350,50; which he may spend in a year, and lay up $400 per annum.

365 days : 1 day : : $400 : $3,70, *A.*

(49.)

$\frac{2}{3} = \frac{4}{6}$, and $\frac{1}{2} = \frac{3}{6}$; then $\frac{4}{6} + \frac{3}{6} = \frac{7}{6} = 1\frac{1}{6}$, that is, 1 to carry, and $\frac{1}{6}$ to write down. (See answer.)

72 d. : 54 d. : : $1,00 : $0,75
72 d. : 30 d. : : $1,00 : $0,41$\frac{2}{3}$
72 d. : 18 d. : : $1,00 : $0,25
72 d. : 45 d. : : $1,00 : $0,62$\frac{1}{2}$
A. $2,04$\frac{1}{6}$.

(50.)

1 gal. : 3276 gals. : : 3 cts. : $98,28.

(51.)

406,80 — 300 = 106,80.

1602 qrs. : 6 qrs. : : $106,80 : $0,40, *A.*

(52.)

20 + 50 gallons run *out* in the same hour that 120 gallons run *in*; consequently but 50 stay in [120 — 70 = 50] in 1 hour.

50 gals. : 600 gals. : : 1 h. : 12 hours, *A.*

(53.)

40 × 45 = 1800 yds.

18 yds. : 1800 yds. : : $15 : $1500
9 yds. : 1800 yds. : : $ 6 : $1200
A. $ 300.

By Ratio.

$$\begin{array}{r} 1800 \div 18 = 100 \times 15 = \$1500 \\ 1800 \div 9 = 200 \times 6 = \underline{\$1200} \\ A.\ \underline{\$300.} \end{array}$$

(54.)

It is plain that A ought not to lend B \$800, being a larger sum, for so long a time as he borrowed the \$600, it being a smaller sum; therefore, make the less number the second or multiplying term, and the greater number the first term.

\$800 : \$600 : : 3 yrs. : 2 yrs. 3 mo. 0 days.
\$900 : \$600 : : 3 yrs. : 2 yrs. 0 mo. 0 days.
\$500 : \$600 : : 3 yrs. : 3 yrs. 7 mo. 6 days.
\$1200 : \$600 : : 3 yrs. : 1 yr. 6 mo. 0 days.
A. 9 yrs. 4 mo. 6 days.

(55.)

1½ yd. = 6 qrs.; ¾ yd. = 3 qrs.
3 qrs. : 6 qrs. : : 3 yds. : 6 yds., *A.*
$6 \div 3 = 2 \times 3 = 6$ yds., *A.*

(56.)

$800 \times 4\frac{5}{8} = 3700$ yds. for all the men.
3 qrs. : 7 qrs. : : 3700 yds.

$$\begin{array}{rlll} & \underline{7} & 4 & 4 \\ 3\,) & 25900 & 0\text{ qrs.}; & 0\text{ na.} \\ \hline A. & 8633\text{ yds.} & 1\text{ qr.}; & 1\frac{1}{3} \end{array}$$

FRACTIONS. (p. 196—198.)

(58.)

$3=\frac{3}{1}$.

$\frac{3}{1}$ lbs. : $\frac{1}{2}$ :: $\$\frac{3}{8}$.

$\frac{3}{1}$ inverted, becomes $\frac{1}{3}$.

$$\frac{1}{3}\times\frac{1}{2}\times\frac{3}{8}=\frac{3}{48}=\$\frac{1}{16},\ A.$$

(59.)

$\frac{1}{3}$ bu. : $\frac{1}{1}$ bu. :: $\$\frac{3}{16}$.

$$\frac{3}{1}\times\frac{1}{1}\times\frac{3}{16}=\$\frac{9}{16},\ A.$$

(60.)

$1\frac{3}{4}=\frac{7}{4}$.

$\frac{7}{4}$ yd. : $\frac{1}{1}$ yd. :: $\$\frac{7}{12}$.

$$\frac{4}{7}\times\frac{1}{1}\times\frac{7}{12}=\frac{28}{84}=\$\frac{1}{3},\ A.$$

(61.)

$\frac{1}{1}$ lb. : $\frac{40}{1}$ lb. :: $\$\frac{1}{16}$.

$$\frac{1}{1}\times\frac{40}{1}\times\frac{1}{16}=\frac{40}{16}=\$2\frac{1}{2},\ A.$$

(62.)

$2\frac{3}{25}=\frac{53}{25}$.

$\frac{3}{4}$ yd. : $\frac{1}{1}$ yd. :: $\$\frac{53}{25}$.

$$\frac{4}{3}\times\frac{1}{1}\times\frac{53}{25}=\frac{212}{75}=\$2{,}82\frac{2}{3},\ A.$$

(63.)

$\frac{1}{2}$ of $\frac{3}{4}=\frac{3}{8}$.

$\frac{3}{8}$ yd. : $\frac{1}{1}$ yd. :: $\$\frac{2}{1}$.

$$\frac{8}{3}\times\frac{1}{1}\times\frac{2}{1}=\frac{16}{3}=\$5\frac{1}{3},\ A$$

(64.)

$\frac{3}{4}$ of $\frac{7}{8}$ of $\frac{5}{16} = \frac{105}{512}$.

$\frac{105}{512}$: $\$\frac{5}{1}$: : $\frac{20}{1}$ apples.

$\frac{512\times5\times20}{105\times1\times1} = \frac{51200}{105} = 487\frac{13}{21}$ apples, *A.*

(65.)

$\frac{5}{6}$ oz. : $\frac{1}{1}$ oz. : : \$, $\frac{150}{1}$.

$\frac{6\times1\times150}{5\times1\times1} = \frac{900}{5} = \$1,80$, *A.*

(66.)

$16\frac{7}{8} = \frac{135}{8}$.

$\frac{8}{1}$ coats : $\frac{1}{1}$ coat : : $\frac{135}{8}$ yds.

$\frac{1\times1\times135}{8\times1\times8} = \frac{135}{64} = 2\frac{7}{64}$ yds., *A.*

(67.)

$\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8}$; $5\frac{1}{2} = \frac{11}{2}$.

$\frac{3}{8}$ gal. : $\frac{11}{2}$ gal. : : $\$\frac{5}{8}$.

$\frac{8\times11\times5}{3\times2\times8} = \frac{440}{48} = \$9\frac{1}{6}$, *A.*

(68.)

$14\frac{3}{4} = \frac{59}{4}$; $5\frac{3}{5} = \frac{28}{5}$.

$\frac{6}{1}$ yds. : $\frac{59}{4}$ yds. : : $\$\frac{28}{5}$.

$\frac{1\times59\times28}{6\times4\times5} = \frac{1652}{120} = \$13\frac{23}{30}$, *A*

(69.)

$\frac{1}{2}$ of $\frac{7}{8} = \frac{7}{16}$.

$\frac{7}{16}$ cwt. : $\frac{40}{1}$ cwt. : : $\$\frac{9}{10}$

$\frac{16\times40\times9}{7\times1\times10} = \frac{5760}{70} = \$82\frac{2}{7}$, A

(70.)

$\frac{3}{4}$ of $\frac{5}{8}=\frac{15}{32}$.

$\frac{3}{4}$ yd. : $\frac{50}{1}$ yds. : : $\$\frac{15}{32}$.

$\frac{4}{3}\times\frac{50}{1}\times\frac{15}{32}=\frac{3000}{96}=\$31\frac{1}{4}$, *A.*

(71.)

$\frac{1}{1}$ cwt. : $\frac{5}{112}$ cwt. : : $\$\frac{15}{16}$.

$\frac{1}{1}\times\frac{5}{112}\times\frac{15}{16}=\$\frac{75}{1792}$, *A.*

(73.)

$\frac{3}{4}$: $\frac{2}{3}$ yr. : : $\$\frac{960}{1}$.

$\frac{4}{3}\times\frac{2}{3}\times\frac{960}{1}=\frac{7680}{9}=\$853\frac{1}{3}$, *A.*

(74.)

The less days, the more men; therefore, make $12\frac{1}{4}$ days the second or multiplying term.

$6\frac{1}{8}=\frac{49}{8}$; $12\frac{1}{4}=\frac{49}{4}$.

$\frac{49}{8}$ days : $\frac{49}{4}$ days : : 12 men.

$\frac{}{49}\times\frac{49}{4}\times\frac{12}{1}=\frac{4704}{196}=24$ men, *A.*;

or,

$\frac{8}{49}$ and $\frac{49}{4}=\frac{8}{\cdot}$ and $\frac{\cdot}{4}=\frac{8}{4}=2$. (See note, page 119, between the 6th and 7th examples.) The Ratio, then, is 2. 2 times 12 men (the 3d term) $=24$ men, *A.*

DECIMALLY.

(76.)

$1\frac{1}{2}=1,5$.

1,5 lbs. : 49,2 lbs. : : \$3,84.

3,84 × *49,2* = 188,928 ÷ 1,5 = \$125,952, *A.*

(77.)

$\frac{3}{4}$ = ,75; $\frac{1}{2}$ = ,5.

$29,75 : $60 : : 59,5 yds.

59,5 × 60 = 3570,0 ÷ 29,75 = 120 yds., *A.*

(78.)

$37,75 : $75,50 : : 267,75 yds.

267,75 × 75,50 = 20215,1250 ÷ 37,75 = 535,5 = 535$\frac{1}{2}$ yds., *A.*

By Ratio.

7550 ÷ 37,75 = 2 × 267,75 = 535,50 = 535$\frac{1}{2}$ yds., *A.*

COMPOUND PROPORTION.

¶ LXXIV. (p. 198.)

(2.)

One man will mow $\frac{1}{4}$ of 96 acres, that is, 24 acres, in 12 days; and in 1 day he will mow $\frac{1}{12}$ of 24 acres, which is 2 acres, that is, 2 acres per day. Then 8 men will mow 8 times 2 acres, = 16 acres, in 1 day; and in 16 days, 16 times 16 acres, which is 256 acres, the *answer.*

(3.)

Eight persons, in 1 month, will spend $\frac{1}{24}$ of $480 = $20; and 1 person, in 1 month, will spend $\frac{1}{8}$ of $20, which is 2\frac{1}{2}$. Then 16 persons will spend 16 times 2$\frac{1}{2}$, or, which is the same thing, 2$\frac{1}{2}$ times 16 = $40, in 1 month, and, in 8 months, 8 times 40, = $320, *A.*

More Exercises for the Slate. (p. 201, 202.)

(3.)

In this example, the demand evidently is, How much money will be received? We therefore write $24 for the 3d term, as in Simple Proportion, or the Rule of Three. We next select, for the 1st and 2d terms, any two numbers which are of the same kind or denomination, say 4 men and 8 men. Now, it is plain, that, if 4 men receive $24, 8 men would receive more; we therefore make the greater number, 8, the 2d term, and the smaller number, 4, the 1st term. We next take the two remaining numbers, viz., 6 days, and 12 days, and, because 12 days' work will cost more than 6 days' cost, we write the 12 days for a second term, under the other second term, and the 6 days, for a first term, under the other first term; as in the following operation.

$$\begin{array}{ccc} \textit{1st term.} & \textit{2d term.} & \textit{3d term.} \\ \left.\begin{array}{lcl} 4 \text{ men} & : & 8 \text{ men} \\ 6 \text{ days} & : & 12 \text{ days} \end{array}\right\} & :: & \$24. \end{array}$$

$24 \times 8 \times 12 = 2304$; $4 \times 6 = 24$; $2304 \div 24 = \$96$, *A.*

By Ratio.

The ratio of 4 to 8 is 2, and of 6 to 12, 2; then, $2 \times 2 = 4 \times 24 = \$96$, *A.*

By Analysis.

One man will receive $\frac{1}{4}$ of $\$24 = \$6$, and for 1 day, $\frac{1}{6}$ of $6 = \$1$, that is, 1 dollar for 1 day. Then, 8 men will receive $8 \times 1 = \$8$, for 1 day, and $12 \times 8, = \$96$, for 8 days. *A.* $96.

(4.)

The 3d term is 4 men, because it is like the answer. The 1st term is $24, and the 2d term is $96, because the latter will hire more men than the former. Of the two remaining terms, 6 days and 12 days. we place the smaller one, 6, for a 2d term, under the other 2d term, because 12 day.

will require less men to perform the same work, than 6 days, which is the object of inquiry in the question.

$$\left.\begin{array}{r} \$24 : \$96 \\ 12\text{ days} : 6\text{ days} \end{array}\right\} :: 4\text{ men.}$$

$4 \times 96 \times 6 = 2304$; $24 \times 12 = 288$; $2304 \div 288 = 8$ men, *A.*

The ratio of 24 to 96 is 4, and of 12 to 6 is $\frac{1}{2}$; then $4 \times \frac{1}{2}$, or $\frac{1}{2}$ of 4, is 2, and 2 times $4 = 8$ men, the answer.

One man receives $\frac{1}{4}$ of $\$24 = \$6$, for 6 days, which is clearly $1 for 1 day. Then $96 will hire 96 men for 1 day each; but for 12 days, it will hire only $\frac{1}{12}$ of $96, = 8$ men, the answer.

(5.)

Here it is required to find what 4 men will receive, which, of course, must be less than what 8 receive; the 2d term, then, must be smaller than the 1st term.

If 12 days cost $96, 6 days must cost less; therefore write 6, the smaller number, for a 2d term, under the other 2d term, and the 12 for a 1st term, under the other 1st term.

$$\left.\begin{array}{r} 8\text{ men} : 4\text{ men} \\ 12\text{ days} : 6\text{ days} \end{array}\right\} :: \$96.$$

$96 \times 4 \times 6 = 2304$; $8 \times 12 = 96$; $2304 \div 96 = \$24$, *A.*

The ratio of 8 to 4 is $\frac{1}{2}$, and of 12 to 6 is likewise $\frac{1}{2}$, then $\frac{1 \times 1}{2 \times 2} = \frac{1}{4} \times 96 = \$24$, *A.*

$96 \div 8 = \$12$, for 12 days; then 12 in 12, 1 time, that is, $1 for 1 day; and 4 times 1 being 4, makes it $4 for 4 days; and 4 times 6 being 24, makes it $24 for 6 days, the answer.

(6.)

We write $24, as a 2d term, because it will hire the same men a less number of days than $96.

Again, we make 8 a 2d term, because 4 men may be hired longer, for the same money, than 8 men

$$\left.\begin{array}{r} \$96 : \$24 \\ 4\text{ men} : 8\text{ men} \end{array}\right\} :: 12\text{ days.}$$

$96 \times 4 = 384$; $24 \times 12 \times 8 = 2304 \div 384 = 6$ days, *A.*

The ratio of 96 to 24 is $\frac{1}{4}$, and of 4 to 8 is 2; then $\frac{1}{4} \times 2 = \frac{2}{4} = \frac{1}{2}$, and $\frac{1}{2} \times 12 = 6$ days, *A.*

$96 \div 8 = 12 \div 12 = \$1$ for 1 day for each man; then $1 \times 24 = \$24$, which will hire 1 man 24 days, but 4 men only $\frac{1}{4}$ of 24 days, = 6 days, *A.*

(7.)

Three persons will spend less than 9 persons; 3, then, is the 2d term.

Again, 4 months will require less money than 12 months; 4, then, is a 2d term, to be written under the other 2d term.

$$\left.\begin{array}{r} 9 \text{ persons} : 3 \text{ persons} \\ 12 \text{ months} : 4 \text{ months} \end{array}\right\} :: \$1512.$$

$9 \times 12 = 108$; $1512 \times 3 \times 4 = 18144 \div 108 = \$168$, *A.*

The ratio of 9 to 3 is $\frac{1}{3}$, and of 12 to 4 is $\frac{1}{3}$; then $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9} \times 1512 = \$168$, *A.*

$\$1512 \div 9$ persons $= \$168, \div 12$ months $= \$14$; then 3 persons will spend 3 times \$14, = \$42, and 4 months will require 4 times \$42, = \$168, *A.*

(8.)

Make 3 months the 3d term. \$6000 will support more men, for the same length of time, than \$2000; \$6000, then, must be the 2d term, and \$2000, the 1st term.

Four times as many men is 4 times 150, = 600 men, who, of course, cannot be supported on the same money near so long as the 150 men; therefore make the 150 a 2d term, and the 600 a 1st term; both to be placed under their corresponding terms above.

$$\left.\begin{array}{r} \$2000 : \$6000 \\ 600 \text{ men} : 150 \text{ men} \end{array}\right\} :: 3 \text{ months}.$$

$2000 \times 600 = 1200000$; $3 \times 6000 \times 150 = 2700000 \div 1200000 = 2\frac{1}{4}$ months, *A.*

The ratio of 2000 to 6000 is 3, and of 600 to 150 is $\frac{150}{600} = \frac{1}{4}$; *then* $\frac{1}{4} \times 3 \times 3 = \frac{9}{4} = \$2\frac{1}{4}$, *A*

(9.)

The \$6 is gain; therefore write it for a 3d term. The \$900 will gain more than the \$600; the former, then, must be the 2d term.

In 8 months, the gain will be less than in 1 year, or 12 months; the 8, then, must be a 2d term, to be written under the other 2d term.

$$\left.\begin{matrix}\$100 : \$900 \\ 12\,\text{mo.} : 8\,\text{mo.}\end{matrix}\right\} :: \$6.$$

$100 \times 12 = 1200$; $900 \times 8 \times 6 = 43200 \div 1200 = \$36$, *A.*

The ratio of 100 to 900 is 9, and of 12 to 8 is $\frac{2}{3}$, $\times 9 = 6 \times 6 = \$36$, *A.*

(10.)

In this example, we write \$100 for the 2d term, because \$900 will require less time to gain the same amount, than \$100 requires.

Again, \$36 gain will require more time than \$6 gain; it should, therefore, be made another 2d term.

$$\left.\begin{matrix}\$900 : \$100 \\ \$6 : \$36\end{matrix}\right\} :: 12\text{ mo.}$$

$900 \times 6 = 5400$; $100 \times 36 \times 12 = 43200 \div 5400 = 8$ months, the answer.

The ratio of 900 to 100 is $\frac{1}{9}$, and of 6 to 36 is 6; then $6 \times \frac{1}{9}$ is $\frac{6}{9}$, or $\frac{2}{3}$ and $\frac{2}{3} \times 12 = 8$ months, the answer.

(11.)

The \$57,12, being like the answer, is to occupy the 3d place.

Then, as 12 cwt. 3 qrs. cost less than 10 tons will cost, it must occupy the 1st place, and the 10 tons, the 2d place.

Again, as the transportation for 75 miles will cost less than for 400 miles, 75 must occupy the 2d place, and the other number, the 1st place.

$$\left.\begin{array}{r}12\text{ cwt. }3\text{ qrs.}=51\text{ qrs.}\\10\text{ tons}=800\text{ qrs.}\end{array}\right\}\left.\begin{array}{l}51\text{ qrs}:800\text{ qrs.}\\400\text{ miles}:75\text{ miles}\end{array}\right\}::\$57,12.$$

$51 \times 400 = 20400$; $800 \times 75 = 60000 \times 57,12 = 3427\text{-}20000 \div 20400 = \$168$, *A.*

(12.)

By subtracting $150 from $160, we find the gain or interest to be $10, which, of course, occupies the 3d place.

Rate per cent., it will be recollected, means so much on $100 for 12 months, or 1 year.

Now, as $100 will gain less than $150, in the same time, let the latter form a 1st term, and the former, a 2d term.

Again, as 12 months will gain more, in the same time, than 8 months, let it occupy the 2d place, and the other number, the 1st place.

$$\left.\begin{array}{l}\$150:\$100\\8\text{ mo.}:12\text{ mo.}\end{array}\right\}::\$10.$$

$150 \times 8 = 1200$; $100 \times 12 \times 10 = 12000 \div 1200 = \$10$ gain; that is, 10 per cent.

The ratios, as you may perceive, are $\frac{2}{3}$ and $\frac{3}{2}$, which, by cancelling equal terms, on the principles suggested in ¶ XLI balance each other, leaving nothing but 1 to multiply the 3d term by; consequently, the 3d term is the answer, as it stands.

Questions on the Foregoing. (p. 202—205.)

1. What will 2 yds. of cloth cost, at 50 cents (or $\$\frac{1}{2}$) a yard? *A.* $2 \div 2 = \$1$.

What will 10 yds.? *A.* $10 \div 2 = \$5$.

What will 100 yds.? *A.* $50.

What will 5 yds.? *A.* $2,50.

What will 9 yds.? *A.* $4,50.

2. At 25 cents (or $\$\frac{1}{4}$) a yard, what will 4 yds. cost? *A.* $4 \div 4 = \$1$.

What will 12 yds.? *A.* $12 \div 4 = \$3$.

What will 40 yds.? *A.* $\$10$.

What will 300 yds.? *A.* $\$75$.

3. At $\$,33\frac{1}{3}$, (or $\$\frac{1}{3}$,) what will 6 yds. cost? *A.* $6 \div 3 = \$2$.

What will 9 yds.? *A.* $\$3$.

Will 24 yds.? *A.* $\$8$.

Will 300 yds.? *A.* $\$100$.

Will 7 yds.? *A.* $\$2\frac{1}{3}$, or $\$2,33\frac{1}{3}$.

Will 25 yds.? *A.* $\$8,33\frac{1}{3}$.

4. At $\$,16\frac{2}{3}$, (or $\$\frac{1}{6}$,) what will 12 yds. cost? *A.* $12 \div 6 = \$2$.

Will 13 yds. cost? *A.* $\$2,16\frac{2}{3}$.

Will 14 yds. cost? *A.* $\$2,33\frac{1}{3}$.

Will 25 yds. cost? *A.* $\$4,16\frac{2}{3}$.

Will 120 yds.? *A.* $\$20$.

Will 300 yds.? *A.* $\$50$.

5. At $\$,12\frac{1}{2}$ (or $\$\frac{1}{8}$) a yard, what will 16 yds. cost? *A.* $16 \div 8 = \$2$.

Will 96 yds.? *A.* $\$12$.

Will 97 yds.? *A.* $\$12,12\frac{1}{2}$.

Will 100 yds.? *A.* $\$12,50$.

6. At $\$,06\frac{1}{4}$, (or $\$\frac{1}{16}$,) what will 33 yds. cost? *A.* $33 \div 16 = \$2\frac{1}{16}$, which is $\$2,06\frac{1}{4}$.

Will 66 yds.? *A.* $\$4,12\frac{1}{2}$.

7. What will 4 qts. of molasses cost, at 2 cents a gill? *A.* 4 × 2 pts. × 4 gills × 2 cents = 64 cts.

8. How many shillings in 4£.? *A.* 4 × 20 s. = 80 shillings.

In 8£.? *A.* 160 shillings.

In 3£. 5 s.? *A.* 3£. is 60 s. + 5 s. = 65 shillings.

9. How many minutes in 8 hours? *A.* 8 × 60 m. = 480 minutes.

In 12 hours? *A.* 720 minutes.

10. How many cents is $\frac{1}{8}$ of a dollar? *A.* $12\frac{1}{2}$ cts.

Is $\$\frac{1}{16}$? *A.* $6\frac{1}{4}$ cts.

Is $\$\frac{1}{6}$? *A.* $16\frac{2}{3}$ cts.

Is $\$\frac{1}{4}$? *A.* 25 cts.

Is $\$\frac{1}{5}$? *A.* 20 cts.
Is $\$\frac{1}{3}$? *A.* $33\frac{1}{3}$ cts.
Is $\$\frac{3}{16}$? *A.* $18\frac{3}{4}$ cts.
Is $\$\frac{3}{8}$? *A.* $37\frac{1}{2}$ cts.
Is $\$\frac{7}{16}$? *A.* $43\frac{3}{4}$ cts.
Is $\$\frac{9}{16}$? *A.* $56\frac{1}{4}$ cts.
Is $\$\frac{5}{8}$? *A.* $62\frac{1}{2}$ cts.
Is $\$\frac{11}{16}$? *A.* $68\frac{3}{4}$ cts.
Is $\$\frac{3}{4}$? *A.* 75 cts.
Is $\$\frac{13}{16}$? *A.* $81\frac{1}{4}$ cts.
Is $\$\frac{7}{8}$? *A.* $87\frac{1}{2}$ cts.
Is $\$\frac{15}{16}$? *A.* $93\frac{3}{4}$ cts.

11. How many pence in 3 s. 9 d.? *A.* 45 d.
In 8 s. 6 d.? *A.* 102 d.

12. How many cents in 2 s.? *A.* $33\frac{1}{3}$ cts.
In 3 s.? *A.* 50 cts.
In 3 s. 9 d.? *A.* $62\frac{1}{2}$ cts.

13. How many cents will buy 3 slates, at 1 s. 9 d. each? *A.* $87\frac{1}{2}$.

14. How many cents are 18 d.? *A.* 25 cts.
Are 2 s. 6 d.? *A.* $41\frac{2}{3}$ cts., called 42 cts.
Are 5 s. 3 d.? *A.* $87\frac{1}{2}$ cts.

15. What kind of a fraction is $\frac{3}{4}$? *A.* A proper fraction.
Is $14\frac{1}{2}$? *A.* A mixed number.
Is $\frac{1}{2}$ of $\frac{2}{3}$? *A.* A compound fraction.
Is $\frac{25}{3}$? *A.* An improper fraction.
Is $\frac{6}{7}$? *A.* A proper or common fraction.

16. What mixed number is equal to $\frac{16}{5}$? *A.* $3\frac{1}{5}$.
$\frac{17}{8}$? *A.* $2\frac{1}{8}$.

17. How many 5ths in $8\frac{3}{5}$? *A.* $\frac{43}{5}$.
In $4\frac{1}{5}$? *A.* 21 fifths.

18. How many pounds in $\frac{40}{20}$£. *A.* 2£.
In $\frac{80}{20}$£. *A.* 4£.

19. How many pounds and shillings in $10\frac{3}{20}$£.? $\frac{1}{20}$ is 1 s. *A.* 10£. 3 s.
In $8\frac{5}{20}$£. *A.* 8£. 5 s.

20. How many shillings in $\frac{36}{3}$ d.? *A.* 3 shillings.
In $\frac{144}{12}$ d.? *A.* 12 shillings.

21. What fraction is equal to $\frac{4}{8}$? *A.* $\frac{1}{2}$.
$\frac{9}{12}$? *A.* $\frac{3}{4}$.
$\frac{4}{20}$? *A.* $\frac{1}{5}$.

22. What kind of a fraction is ,5? *A.* A decimal fraction.
Is 14,3? *A.* A mixed decimal.

23. What will be the cost of 3 books, at $,5 apiece? *A.* ,5 $= \frac{5}{10}$ of a dollar, which is 50 cts. $\times 3 =$ \$1,50; or $3 \times$,5 $=$ \$1,5 $=$ \$1,50.
At $,25? *A.* 75 cts.

24. What decimal fraction is equal to $\frac{1}{2}$? *A.* ,5.
$\frac{3}{4}$? *A.* ,75.
$\frac{1}{5}$? *A.* ,2.

25. Bought ,4 of a bushel of rye at one time; at another, ,25; and at another, ,35: how much did I buy in all? *A.* 1 bushel.

26. How much is $\frac{3}{4}$ of a shilling? *A.* 9 d.
$\frac{5}{6}$ s.? *A.* 10 d.
$\frac{1}{2}$ s.? *A.* 6 d.

27. How much is $\frac{1}{2}$ of $\frac{1}{2}$? *A.* $\frac{1}{4}$.
Is $\frac{1}{2}$ of $\frac{1}{8}$? *A.* $\frac{1}{16}$.
Is $\frac{1}{8}$ of $\frac{1}{12}$? *A.* $\frac{1}{96}$.

28. How much is 3 times $\frac{1}{2}$? *A.* $1\frac{1}{2}$.
3 times $\frac{2}{3}$? *A.* $\frac{6}{3} = 2$.
3 times $\frac{7}{8}$? *A.* $\frac{21}{8} = 2\frac{5}{8}$.

29. A man bought $\frac{1}{4}$ of a barrel of flour, for 3 dollars: how much was it a barrel? *A.* If $\frac{1}{4}$ is 3 dollars, 4 quarters, or a whole barrel, must be 4 times 3, = \$12, per barrel.

30. 3 is $\frac{1}{4}$ of what number? *A.* $3 \times 4 = 12$.

31. 5 is $\frac{1}{6}$ of what number? *A.* $5 \times 6 = 30$.

32. 10 is $\frac{1}{8}$ of what number? *A.* $10 \times 8 = 80$.

33. 7 is $\frac{1}{9}$ of what number? *A.* $7 \times 9 = 63$.

34. $\frac{1}{2}$ of 6 is $\frac{1}{4}$ of what number? *A.* $\frac{1}{2}$ of $6 = 3 \times 4 = 12$.

35. $\frac{1}{3}$ of 12 is $\frac{1}{5}$ of what number? *A.* $\frac{1}{3}$ of $12 = 4 \times 5 = 20$.

36. $\frac{2}{3}$ of 12 is $\frac{1}{5}$ of what number? *A.* $\frac{2}{3}$ of $12 = 8 \times 5 = 40$.

37. $\frac{3}{4}$ of 12 is $\frac{1}{3}$ of what number? *A.* $\frac{3}{4}$ of $12 = 9 \times 3 = 27$.

38. If a man save $\frac{1}{8}$ of a dollar a day, how many dollars will he save in 16 days? *A.* $\frac{1}{8} \times 16 = \frac{16}{8} =$ \$2.

How many in 17 days? *A.* \$2,12$\frac{1}{2}$.

In 25 days? *A.* \$3,12$\frac{1}{2}$.

39. In $\frac{16}{8}$ how many times 1? *A.* 2.

40. In $\frac{17}{8}$ how many times 1? *A.* $2\frac{1}{8}$.

41. In $\frac{25}{8}$ how many times 1? *A.* $3\frac{1}{8}$.

42. In $\frac{144}{12}$ how many times 1? *A.* 12.

43. William gave away 1 apple and $\frac{1}{2}$, which was $\frac{1}{3}$ of all he had; how many had he? $\frac{3}{3}$ is 3 times as much as $\frac{1}{3}$; hence, if $1\frac{1}{2}$ is $\frac{1}{3}$ of a certain number, the number must be 3 times $1\frac{1}{2}$: thus, $1\frac{1}{2} = \frac{3}{2}$; then $\frac{3}{2} \times 3 = \frac{9}{2} = 4\frac{1}{2}$, *A.*

44. $2\frac{1}{4}$ is $\frac{1}{5}$ of what number? *A.* (If $2\frac{1}{4}$ is $\frac{1}{5}$, $\frac{5}{5}$, or the number, is 5 times as much; that is, 5 times $2\frac{1}{4} =$) $11\frac{1}{4}$.

45. $1\frac{3}{4}$ is $\frac{1}{3}$ of what number? *A.* $5\frac{1}{4}$.

46. $1\frac{2}{3}$ is $\frac{1}{7}$ of what number? *A.* $11\frac{2}{3}$.

47. William gave \$,25 for 2,5 yds. of ribbon; how much was it a yard? *A.* 10 cts.

48. Divide 3,5 by ,7. *A.* 5.

49. Divide 3,5 by ,07. *A.* 50.

50. Multiply 5 by ,7. *A.* 3,5.

51. Multiply 50 by ,07. *A.* 3,5.

52. How much will $\frac{1}{2}$ of a peck of salt cost, at \$1 a bushel? *A.* \$$\frac{1}{8}$, or $12\frac{1}{2}$ cts.

53. How many drachms is $\frac{1}{8}$ of an ounce? *A.* 2.

54. How much is $\frac{1}{8}$ of a yard? *A.* 2 nails.

55. How much is $\frac{3}{4}$ of a day? *A.* 18 hours.

56. How much is $\frac{3}{12}$ of a minute? *A.* 15 sec.

57. If you give 6 cents a quart for ale, how much is that a gallon? *A.* 24 cts.

58. If a man earn \$3 a week, how much is that for each *working day* in a week? *A.* 50 cts.

59. If a man travel 6 miles in 2 hours, how far will he travel in 16 hours? *A.* $6 \div 2 = 3$ miles an hour, $\times 16$ hours $= 48$ miles.

60. What is the ratio of 2 to 6? *A.* $\frac{6}{2} = 3$.
Of 6 to 2? *A.* $\frac{1}{3}$.
Of 9 to 6? *A.* $\frac{2}{3}$.
Of 6 to 9? *A.* $\frac{3}{2}$.
Of 10 to 100? *A.* 10.

61. If 20 bushels of apples cost $10, what will 5 bushels cost? *A.* $10,00 \div 20 = 50$ cts. a bushel, $\times 5 =$ $2,50.

62. What is the ratio of 20 to 5? *A.* $\frac{1}{4}$.

63. If 6 gallons of water fall into a cistern, containing 12 gallons, in 1 hour, and 3 gallons leak out in an hour, how long will it take the cistern to be filled? *A.* 6 gallons $- 3 = 3$ gallons stay in every hour; then, as many times as 3 is contained in 12, so many hours it will take to fill it. 3 in $12 = 4$ hours.

64. If 4 men, in 1 day, consume 3 loaves of bread, how many loaves will 12 men consume in 4 days? *A.* $3 \div 4 = \frac{3}{4}$ of a loaf $\times 12 = 9$ loaves $\times 4$ days $\times 36$ loaves.

65. If 6 men, in 12 days, reap 18 acres of grain, how many acres will 12 men reap in 4 days? *A.* $18 \div 6$ men $= 3$ acres $\div 12$ days $= \frac{3}{12} = \frac{1}{4}$ acre $\times 12 = \frac{12}{4} = 3$ acres $\times 4 = 12$ acres.

66. What part of 1 month is 15 days? *A.* $\frac{1}{2}$ mo.
Is 1 day? *A.* $\frac{1}{30}$.
Is 2 days? *A.* $\frac{1}{15}$.
Is 3 days? *A.* $\frac{1}{10}$
Is 5 days? *A.* $\frac{1}{6}$.
Is 10 days? *A.* $\frac{1}{3}$.
Is 20 days? *A.* $\frac{2}{3}$.

67. What is the interest of $20 for 4 months? *A.* 40 cts.
For 10 months? *A.* $1,00.
For 3 months? *A.* $0,30.
For 1 yr. 4 mo.? *A.* $1,60.

68. What is the amount of $40 for 2 mo.? *A.* $40,40.

For 5 months? *A.* $41,00.

For 10 months? *A.* $42,00.

For 1 yr. 8 mo.? *A.* $44,00.

69. What is the interest of $60 for 15 days? *A.* 15 cts.

For 10 days? *A.* 10 cts.

For 1 day? *A.* 1 ct.

For 5 days? *A.* 5 cts.

For 2 mo. 15 days? *A.* 75 cts.

For 4 mo. 10 days? *A.* 130 cts.

For 1 yr. 8 mo. 15 days? *A.* 615 cts.

70. What must you pay a broker, who gives you $20 in Boston bills, in exchange for Providence bills, at $\frac{1}{2}$ per cent. commission? *A.* 10 cts.

At $\frac{3}{4}$ per cent.? *A.* 15 cts.

At 1 per cent.? *A.* 20 cts.

71. What is my demand for selling $600 worth of cotton, and guarantying the payment, at 5 per cent. commission? *A.* $30.

At 7 per cent.? *A.* $42.

At 4 per cent.? *A.* $24.

72. What is the amount of $1 for 1 yr. 8 mo.? *A.* $1,10.

73. What is the amount of $200 for 1 yr. 8 mo.? *A.* $220.

74. What, then, is the present worth of $220, due 1 yr. 8 mo. hence? *A.* 220 ÷ 1,10 = $200.

75. What is the present worth of $530, due 1 yr. hence? *A.* 530 ÷ 1,06 = $500.

What is the discount? *A.* 530 — 500 = $30.

76. A merchant, having bought cloth for 50 cts. a yard, wishes to mark it so as to gain 10 per cent.; what price must he put on it? *A.* ,50 × 110 = $,55.

What price must he put on it to gain 4 per cent.? *A.* 52 cts.

8 per cent.? *A.* 54 cts.

20 per cent.? *A.* 60 cts.

77. William bought a sled for $3, and sold it so as to gain 10 per cent.; what did he get for it? *A.* $3,30.

Exercises for the Slate. (p. 205—207.)

(1.)

$0,625
$1,125
$1,05
$0,875
$0,0625

A. $3,7375 = $3,73¾.

2. *A.* $16,00 ÷ 144 = $,111+.

(3.)

3600 ÷ 8 = $ 450
3600 ÷ 3 = $1200
3600 ÷ 5 = $ 720

A. $2370.

4. *A.* 20 lbs. × 12 × 20 = 4800 pwts.; 5 oz. 10 pwts. × 20 = 110 pwts.; 4800 ÷ 110 = 43 spoons; and 70 pwts. left = 3 oz. 10 pwts.

5. *A.* $84 — $25 = $59; 3 hhds. = 1512 pts. × 4 = $60,48 — 59 = $1,48.

(6.)

2 cwt. 2 qrs. 8 lbs.
5 cwt. 0 qrs. 15 lbs.
1 cwt. 3 qrs. 0 lbs.

9 cwt. 1 qr. 23 lbs.

12 cwt. 1 qr. 15 lbs.
9 cwt. 1 qr. 23 lbs.

A. 2 cwt. 3 qrs. 20 lbs.

7. *A.* $\frac{3\times7}{4\times8}=\frac{21}{32}$.

8. *A.* $\frac{3}{4}\div\frac{7}{8}$; $\frac{3\times8}{4\times7}=\frac{24}{28}=\frac{6}{7}$.

9. *A.* $\frac{7\times3}{8\times4}=\frac{21}{32}$.

10. *A.* $\frac{7\times4}{8\times3}=\frac{28}{24}=1\frac{1}{6}$.

(11.)

1*st*. 8 yds. 2 qrs. 0 na.
2*d*. 16 yds. 3 qrs. 2 na.
3*d*. 12 yds. 1 qr. 0 na.
4*th*. 7 yds. 1 qr. 1⅓ na.

A. 44 yds. 3 qrs. 3⅓ na.

(12.)

A. ½ and ⅓ = $\frac{3}{6}$ and $\frac{2}{6}$, the difference between which is $\frac{1}{6}$.

A. ¾, ⅓ = $\frac{9}{12}$, $\frac{4}{12}$; difference, $\frac{5}{12}$.

A. We can easily make the denominator in ⅞ equal to that in $\frac{5}{16}$, by multiplying both terms by 2; thus, ⅞ × 2 — $\frac{14}{16}$, and — $\frac{5}{16}=\frac{9}{16}$.

(13.)

A. $\frac{4}{7}$ × 28 s. = $\frac{112}{7}$ ÷ 20 s. = $\frac{4}{5}$£.

(14.)

A. ,003125 × 20 × 12 × 4 = 3 qrs.

(15.)

× ,325 = ,008125
× ,024 = ,0006
× 3,07 = ,07675
× 276, = 6,9
× 25,0005 = ,6250125
A. 7,6104875.

(16.)

29 cwt. 3 qrs. 16 lbs.
— 10 cwt. 3 qrs.
19 cwt. 0 qrs. 16 lbs. = 2144 lbs,
1 ton = 2240 lbs.
2240 lbs : 2144 lbs : : $15.
2144 × 15 = 32160 ÷ 2240 = $14,357 + *A.*

(17.)

The net weight is 6 cwt. 3 qrs. 15 lbs., (which is found by subtracting the weight of the hogshead from the weight of both) = 771 lbs.

1 lb. : 771 lbs. : : $11\frac{1}{4}$ cts.
771 × $11\frac{1}{4}$ = $86,73$\frac{3}{4}$, *A.*

(18.)

$160,50 — $42 = $118,50.
60 yds. = 200 qrs. : 6 qrs. : : *$118,50.*
118,50 × 6 ÷ 200 = $3.555, *A.*

(19.)

600 × $40\frac{3}{4}$ = 24450.

24450 × $2\frac{1}{4}$ = $ 550,125
24450 × $4\frac{1}{2}$ = $1100,25
24450 × 7 = $1711,50
24450 × $5\frac{3}{8}$ = $1314,1875
A. $4676,06$\frac{1}{4}$.

(20.)

× 15 = $30,075
× $31\frac{3}{4}$ = $63,658
× $3\frac{1}{4}$ = $ 6,516
× $7\frac{1}{2}$ and $\frac{18}{60}$ = $15,672
A. $115,921.

(21.)

1st. *For* 1 *yr.* 6 *mo*

200 × 6
12,00
200
212 × 3
6,36
212
218,36, Amount.
200
18,36 C. interest
200 × 9 = 18, S. interest
$0,36, Difference

2d. *For 3 yrs. 4 mo.*

200 × 6
12,00
200
212 × 6
12,72
212
224,72 × 6
13,4832
224,72
238,2032 × 2
4,764064
238,2032
242,967264
200
42,967+ C. in.
00 × 20 = 40, S. inter.
$2,967, Diff.

3d. *For 2 yrs. 6 mo. 15. da.*

The amount, by the last operation, for 2 yrs., =
$$224,72 × $3\frac{1}{4}$.
7,3034
224,72
232,0234
200
32,0234
200 × $15\frac{1}{4}$ = 30,50
$1,523+ Diff.

1st. $0,36
2d. $2,967
3d. $1,523
A. $4,85.

(22.)

× $61\frac{1}{2}$ and $\frac{18}{60}$ + $60 = $97,09
× $52\frac{1}{2}$ and $\frac{9}{60}$ + $60 = $91,59
A. $188,68.

(23.)

× 110 = $0,275
× 112 = $0,28
× 115 = $0,287
× 120 = $0,30
A. $1,142.

I

(24.)

$\$227,66 \times 13\frac{1}{2}$ and $\frac{1}{3} = \$31,492+$.

The amount of $1, for the same time, is $1,1383; then $227,66 ÷ 1,1383 — 200 = $27,66, which, subtracted from $31,492, = $3,832, *A.*

(25.)

× 1,33822, found in the Table, × 520 = $695,87 cts. and 4 mills, but without the Table, 7 mills +.

520 ÷ 130 = $400, Present worth.
520 — 400 = $120, Discount.
$695,87 — 520 = $175,874, C. interest.
120
A. $55,874.

(26.)

$$\left.\begin{array}{lcl} 4\text{ mo.} & : & 6\text{ mo.} \\ 8\text{ h.} & : & 12\text{ h.} \end{array}\right\} :: 300\text{ men.}$$

4×8=32; 6×12×300=21600 ÷ 32 = 675 men, *A.*

By ratio, $\frac{3}{2} \times \frac{3}{2} \times 300 = 675$, *A.*

(27.)

1*st.*

1829 yrs. 6 mo. 15 d.
1826 yrs. 4 mo. 1 d.
3 yrs. 2 mo. 14 d.

2*d.*

1829 yrs. 3 mo. 19 d.
1826 yrs. 8 mo. 20 d.
2 yrs. 6 mo. 29 d.

3*d.*

1826 yrs. 2 mo. 16 d.
1800 yrs. 7 mo. 5 d.
25 yrs. 7 mo. 11 d.

3d. 25 yrs. 7 mo. 11 d.
2d. 2 yrs. 6 mo. 29 d.
1st. 3 yrs. 2 mo. 14 d.
A. 31 yrs. 4 mo. 24 d.

(28.)

1st.

1829 yrs. 6 mo. 16 d.
1828 yrs. 6 mo. 1 d.
1 yr. 0 mo. 15 d.

$120,60 \times 6\frac{1}{4} = \$7,537.$

2d.

1830 yrs. 8 mo. 29 d.
1824 yrs. 5 mo. 15 d.
6 yrs. 3 mo. 14 d.

$120,60 \times 37\frac{1}{2}$ and $\frac{14}{60} = \$45,506.$

3d.

1828 yrs. 11 mo. 1 d.
1825 yrs. 10 mo. 10 d.
3 yrs. 0 mo. 21 d.

$120,60 \times 18\frac{21}{60} = \$22,13$
2d. $45,506
1st. $ 7,537

A. $75,173+

¶ LXXV.

FOR COMPUTING INTEREST ON NOTES. (p. 208.)

(2.)

$ cts.	
500,00	note dated July 1, 1825.
91,25	interest to July 16, 1828, = 3 yrs. 15 d., = (36½ mo.)
591,25	amount of note.
200,00	1st payment, July 16, 1826.
24,00	interest up to July 16, 1828, = 2 yrs. = (24 mo.)
224,00	amount.
40,00	2d payment, Jan. 1, 1827.
3,70	interest to July 16, 1828, = 1 yr. 6 mo. 15 d., = (18½ mo.)
43,70	amount.
230,00	3d payment, March 16, 1827.
18,40	interest to July 16, 1828, = 1 yr. 4 mo = (16 mo.)
248,40	amount.

(*Carried over.*)

(2—*continued.*)

$ cts.	
224,00	several amounts of payments.
43,70	
248,40	
516,10	total amount.
591,25	amount of note.
516,10	amount of payments.
A. 75,15	remains due on the note, July 16, 1828.

(3.)

$ cts.	
1000,00	note dated Jan. 16, 1820.
180,00	interest to Jan 16, 1823, = 3 yrs. = (36 mo.)
1180,00	amount of the note.
600,00	1st payment, March 16, 1821. [(22 mo.)
66,00	interest to Jan. 16, 1823, = 1 yr. 10 mo. =
666,00	amount.
120,00	2d payment, May 1, 1822.
5,10	interest to Jan. 16, 1823, = 8 mo. 15 d. = (8½ mo.)
125,10	amount.
180,00	3d payment, July 16, 1822.
5,40	interest to Jan. 16, 1823, = (6 mo.)
185,40	amount.
666,00	several amounts of payments.
125,10	
185,40	
976,50	total amount.
1180,00	amount of note.
976,50	amount of payments.
A. 203,50	remains due on the note, Jan 16, 1823.

MASSACHUSETTS RULE. (p. 209.)

(2.)

		$ cts.
The principal, $900, on interest from June 16, 1820,		900,00
Interest to July 1, 1821, (12½ mo.)		56,25
Amount		956,25
Payment, July 1,1821, a sum greater than the interest,		150,00
Due July 1, 1821, forming a new principal		806,25
Interest on $806,25, from July 1, 1821, to Sept. 16, 1822, (14½ mo.)		58,45
		864,70
Payment, Sept. 16, 1822		90,00
Due Sept. 16, 1822, forming a new principal		774,70
Interest on the last, from Sept. 16, 1822, to August 16, 1825, (35 mo.)		135,57
		910,27
Payment, a sum less than the interest then due	$ 10	
Payment, a sum less than the interest then due	$ 20	
Payment, a sum greater than the interest then due	$200	
		230,00
Due August 16, 1825, forming a new principal		680,27
Interest on $680,27, from August 16, 1825, to March 1, 1827, (18½ mo.)		62,92
		743,19
Payment, March 1, 1827		300,00
Due March 1, 1827, forming a new principal		443,19
Interest from March 1, 1827, to Sept. 1, 1828, (18 mo.)		39,88
Balance due Sept. 1, 1828 *A.*		$483,07

CONNECTICUT RULE. (p. 211.)

(2.)

$ cts.	
875,00	principal of the note.
188,12	interest to August 10, 1824, 3 yrs. 7 mo. (43 mo.)
1063,12	amount.
260,00	1st payment.
803,12	due August 10, 1824.
65,05	interest to Dec. 16, 1825, (16½ mo.)
868,17	amount.
300,00	2d payment, deducted.
568,17	due Dec. 16, 1825.
34,09	interest for 1 year.
602,26	[end of the year,) being 9½ months.
52,37	amount of 3d payment to Dec. 16, 1826, (the
549,89	due Dec. 16, 1826.
17,87	interest to July 1, 1827, (6½ mo.)
567,76	amount.
150,00	4th payment.
417,76	due July 1, 1827.
29,24	interest to Sept. 1, 1828, (14 mo.)
A. 447,00	due Sept. 1, 1828, the time of settlement.

¶ LXXVI.

PRACTICE IN COMPOUND INTEREST. (p. 211, 212.)

I. (1.)

÷ 2 = 4320£. at 10 s.
÷ 3 = 2880£. at 6 s. 8 d.
÷ 4 = 2160£. at 5 s.
÷ 5 = 1728£. at 4 s.
÷ 6 = 1440£. at 3 s. 4 d.
÷ 8 = 1080£. at 2 s. 6 d.
÷ 12 = 720£. at 1 s. 8 d.
÷ 15 = 576£. at 1 s. 4 d.
÷ 16 = 540£. at 1 s. 3 d.
÷ 20 = 432£. at 1 s.
÷ 24 = 360£. at 10 d.
÷ 30 = 288£. at 8 d.
÷ 48 = 180£. at 5 d.
÷ 96 = 90£. at 2½ d.
A. 16794£.

(2.)

At 1£. per gallon, 20 gallons would cost 20£.; but at 6 s. 8 d. per gallon, they would cost only ⅓ as much. We therefore call the 20 gallons so many pounds, and divide by 3.

3) 20£. 0 s. 0 d.
6£. 13 s. 4 d.
8 ÷ 2 = 4£. 0 s. 0 d.
25 ÷ 4 = 6£. 5 s. 0 d.
30 ÷ 8 = 3£. 15 s. 0 d.
A. 20£. 13 s. 4 d.

II. (7.)

$$\left.\begin{array}{r}10\text{ s.}=\frac{1}{2};\ 20\div 2=10\pounds.\ 0\text{ s.}\\ 2\text{ s. }6\text{ d.}=\frac{1}{8};\ 20\div 8=2\pounds.\ 10\text{ s.}\end{array}\right\}=12\pounds.\ 10\text{ s.}$$

(8.)

$$\left.\begin{array}{r}10\text{ s.}=\frac{1}{2};\ 40\div 2=20\pounds.\ 0\text{ s.}\\ 5\text{ s.}=\frac{1}{4};\ 40\div 4=10\pounds.\ 0\text{ s.}\end{array}\right\}=30\pounds.\ 0\text{ s.}$$

(9.)

$$\left.\begin{array}{r}5\text{ s.}=\frac{1}{4};\ 36\div 4=9\pounds.\\ 2\text{ s. }6\text{ d.}=\frac{1}{8};\ 36\div 8=4\pounds.\ 10\text{ s.}\end{array}\right\}=13\pounds.\ 10\text{ s.}$$

(10.)

$$\left.\begin{array}{r}10\text{ s.}=\frac{1}{2};\ 12\div 2=6\pounds.\ 0\text{ s.}\\ 5\text{ s.}=\frac{1}{4};\ 12\div 4=3\pounds.\ 0\text{ s.}\\ 2\text{ s. }6\text{ d.}=\frac{1}{8};\ 12\div 8=1\pounds.\ 10\text{ s.}\end{array}\right\}=10\pounds.\ 10\text{ s.}$$

A. 66£. 10 s.

(12.)

$\$2,50 \times 5\frac{1}{2}$ yds. $= \$13,75$
$\$2,50 \times 4\frac{1}{4}$ yds. $= \$10,625$
$\$2,50 \times 6\frac{3}{4}$ yds. $= \$16,875$

A. $41,25.

(13.)

3 qrs. $= \frac{1}{2}$ and $\frac{1}{4}$; 16 lbs. $= \frac{1}{7}$ cwt.

$\$4,20 \times 5 \div \frac{1}{2}$ and $\frac{1}{4}$ and $\frac{1}{7}$ ..... $= \$24,75$

(14.)

1 qr. $= \frac{1}{4}$, and 7 lbs. $= \frac{1}{16}$.

$\$3,60 \times 3 \div 4$ and 16 .... $= \$11,925$

(15.)

$\$2,10 \times 4\frac{1}{2}$ .... $= \$\ 9,45$

(16.)

$\$3,40 \times 4\frac{1}{2}$ .... $= \$15,30$

A. $61,425.

FELLOWSHIP.

¶ LXXVII. Rule. (p. 214, 215.)

(2.)

A's, \$150 \$800 : \$150 : : 200 : \$ 37,50, A's gain.
B's, \$250 \$800 : \$250 : : 200 : \$ 62,50, B's gain.
C's, \$400 \$800 : \$400 : : 200 : \$100,00, C's gain.
\$800 \$200,00, Proof.

200 ÷ 800 = ,25 = \$$\frac{1}{4}$ gain on 1 dollar.

(3.)

A, 96 270 tons : 96 tons : : 90 tons : A's, 32.
B, 72 270 tons : 72 tons : : 90 tons : B's, 24.
C, 102 270 tons : 102 tons : : 90 tons : C's, 34.
270 Proof, 90 tons.

By analysis, 90 ÷ 270 = $\frac{1}{3}$ × 96 = 32, A's; $\frac{1}{3}$ of 72 = 24, B's; $\frac{1}{3}$ of 102 = 34, C's.

(4.)

A, \$350,50 \$600 : \$350,50 : : \$120 : A's, \$70,10.
B, \$249,50 \$600 : \$249,50 : : \$120 : B's, \$49,90.
\$600 120, Proof.

By analysis, 120 — 600 = $\frac{1}{5}$ of 350,50 = \$70,10, A's; $\frac{1}{5}$ of 249,50 = \$49,90, B's.

(5.)

÷ 3 = 8400, A. \$25200 : \$ 8400 : : \$7200 : \$2400, A's.
÷ 2 = 12600, B. \$25200 : \$12600 : : \$7200 : \$3600, B's.
4200, C. \$25200 : \$ 4200 : : \$7200 : \$1200, C's.
25200 Proof, \$7200.

The loss is \$25200 — 18000 = \$7200.

By analysis, 7200 ÷ 25200 = $\frac{2}{7}$ × 8400 = \$2400, A's; $\frac{2}{7}$ × 12600 = \$3600, B's; $\frac{2}{7}$ × 4200 = \$1200, C's.

(6.)

162	684 : 162 :: 228 : 54	A.
153	684 : 153 : 228 : 51	
144	684 : 144 :: 228 : 48	
117	684 : 117 :: 228 : 39	
108	684 : 108 :: 228 : 36	
684		

By analysis, $228 \div 684 = \frac{1}{3} \times 162 = 54$; $\frac{1}{3} \times 153 = 51$; $\frac{1}{3} \times 144 = 48$; $\frac{1}{3} \times 117 = 39$; $\frac{1}{3} \times 108 = 36$.

(7.)

A, $300	$400 : $300 :: $1000 :	$750, A's.
B, $100	$400 : $100 :: $1000 :	$250, B's.
$400		$1000, Proof.

By analysis, $1000 \div 400 = 2\frac{1}{2} \times 300 =$ \$750, A's.; $2\frac{1}{2} \times 100 =$ \$250, B's.

(8.)

1	10 : 1 :: $1000 : 100.
2	10 : 2 :: $1000 : 200.
3	10 : 3 :: $1000 : 300.
4	10 : 4 :: $1000 : 400.
10	

By analysis, $1000 \div 10 = 100 \times 1 = 100$; $100 \times 2 = 200$; $100 \times 3 = 300$; $100 \times 4 = 400$.

(9.)

A, $ 350	$3115 : $ 350 :: $1557,50 :	$175,	A's.
B, $1000	$3115 : $1000 :: $1557,50 :	$500,	B's.
C, $1200	$3115 : $1200 :: $1557,50 :	$600,	C's.
D, $ 420	$3115 : $ 420 :: $1557,50 :	$210,	D's.
E, $ 85	$3115 : $ 85 :: $1557,50 :	$ 42,50,	E's.
F, $ 40	$3115 : $ 40 :: $1557,50 :	$ 20,	F's.
G, $ 20	$3115 : $ 20 :: $1557,50 :	$ 10,	G's.
3115	Proof,	$1557,50.	

By analysis, $1557{,}50 \div 3115{,}00 = \frac{1}{2} \times 350 = \$175$, A's.; $\frac{1}{2} \times 1000 = \$500$, B's.; $\frac{1}{2} \times 1200 = \$600$, C's.; $\frac{1}{2} \times 420 = \$210$, D's.; $\frac{1}{2} \times 85 = \$42{,}50$, E's.; $\frac{1}{2} \times 40 = \$20$, F's.; $\frac{1}{2} \times 20 = \$10$, G's.

(10.)

$$\left.\begin{array}{r}7\\10\\12\\15\\\underline{16}\end{array}\right\}\left.\begin{array}{rcrcrcr}60&:&7&::&\$30000&:&\$3500\\60&:&10&::&\$30000&:&\$5000\\60&:&12&::&\$30000&:&\$6000\\60&:&15&::&\$30000&:&\$7500\\60&:&16&::&\$30000&:&\underline{\$8000}\end{array}\right\}A.$$

$$\underline{60} \qquad\qquad\qquad\qquad \underline{\$30000},\ \text{Proof.}$$

(11.)

$$\left.\begin{array}{r}8\\\underline{3}\\\underline{11}\end{array}\right\}\left.\begin{array}{l}11:8::\$220:160,\ \text{A's.}\\11:3::\$220:\ \ 60,\ \text{C's.}\end{array}\right\}\left.\begin{array}{r}160\\-60\end{array}\right\}=100\ \text{for A's trouble}$$

(12.)

By analysis, $\$1920 \div 64000 = 3$ cts. $\times \$1200 = \$36{,}00$, A's.

(13.)

$$\begin{array}{rl}\left.\begin{array}{r}\$1200\times{,}04=\$48{,}00\\2\times{,}70=\$\ \ 1{,}40\end{array}\right\}&=\$\ \ 49{,}40,\ \text{C's.}\\\left.\begin{array}{r}\$1265\times{,}04=\$50{,}60\\1\ \text{poll}=\qquad 70\end{array}\right\}&=\$\ \ 51{,}30,\ \text{D's.}\\\left.\begin{array}{r}\$2125\times{,}04=\$85{,}00\\3\ \text{polls}\times{,}70=\quad 2{,}10\end{array}\right\}&=\$\ \ 87{,}10,\ \text{E's.}\\\left.\begin{array}{r}\$3621\times{,}04=\$144{,}84\\2\ \text{polls}\times{,}70=\qquad 1{,}40\end{array}\right\}&=\$146{,}24,\ \text{F's.}\\\left.\begin{array}{r}\$825{,}50,\times{,}04=\$33{,}02\\3\ \text{polls}\times{,}70=\quad 2{,}10\end{array}\right\}&=\$\ \ \underline{35{,}12},\ \text{H's.}\\\textit{Amount, carried forward,}&\ \ \$369{,}16\end{array}$$

Amount brought forward, $369,16.

$800,40, × ,04 = $32,0160 } = $33,416, I's.
2 polls × ,70 = 1,40 }

$375,25 × ,04 = $15,01 } = $15,71, J's.
1 poll = 70 }

$265,30, × ,04 = $10,6120 } = $12,012, K's.
2 polls × ,70 = 1,40 }

A. $430,298.

COMPOUND FELLOWSHIP.

¶ LXXVIII. (p. 216, 217.)

(2.)

$60 × 4 = 240 } $1700 : $240 :: $50 : $ 7,058+, A's.
$50 × 10 = 500 } $1700 : $500 :: $50 : $14,705+, B's.
$80 × 12 = 960 } $1700 : $960 :: $50 : $28,235+, C's.
$1700

(3.)

80 × 4 = 320 } 800 : 320 :: $48 : $19,20, A's.
60 × 2 = 120 } 800 : 120 :: $48 : $,20, B's.
72 × 5 = 360 } 800 : 360 :: $48 : $21,60, C's.

(4.)

$600 × 16 = $9600 } = $10300 } $19800 : $10300 :: $386 : $200,797+, A's.
$100 × 7 = $ 700 }
$750 × 16 = $12000 } = $ 9500 } $19800 : $9500 :: $386 : $185,202, B's
$250 × 10 = $ 2500 }
$19800

(5.)

$$\left.\begin{array}{r}\$760\times12=\$9120\\ \$540\times11=\$5940\\ \$800\times7=\$5600\end{array}\right\}\begin{array}{l}\$20660:\$9120::\$872:\$384,929,\text{ A's.}\\ \$20660:\$5940::\$872:\$250,71,\text{ B's.}\\ \$20660:\$5600::\$872:\$236,36,\text{ C's.}\end{array}$$

MENSURATION.

¶ LXXIX.

Exercises for the Slate. (p. 220, 221.)

A. $11\times16=176$.

A. $560\times32=17920\div160=112$.

A. $370\times426=157620\div160=985$ acres 20 rods.

(4.)

$$\begin{array}{r}160\div80=2\\ 4\times160\div80=8\\ 200\times160\div80=\underline{400}\\ \textit{A. }\underline{410}\text{ rods.}\end{array}$$

5. *A*. $40,5\times10,25=415,125=415\frac{1}{8}$.

6. *A*. $40\times8\times40\times4=51200\div160=320$ acres.

(7.)

$$\begin{array}{r}\times12\times12\div144=1\\ 12\times24\div144=2\\ 12\times36\div144=3\\ 20\times12\div12=\underline{20}\\ \textit{A. }\underline{26}\text{ feet.}\end{array}$$

8. *A*. $1,5\times18,75=28,125=28\frac{1}{8}$ feet.

9 *A*. $21,25\times13,5=286,875\div1\frac{1}{4}$, (which is done by multiplying first by 4 qrs., and then dividing the product by 5 qrs.) $=229,500\div9=25,50=25\frac{1}{2}$ yards.

(10.)

$30{,}5 \times 20 = 610{,}0$ = 1st end.
$30{,}5 \times 20 = 610{,}0$ = the other end.
$40{,}75 \times 20 = 815{,}00$ = 1st side.
$40{,}75 \times 20 = \underline{815{,}00}$ = the other side.
$\underline{2850}$ feet.

$2850 \times 10 \div 1000 = \$28\frac{1}{2}$, *A.*

11. *A.* $16{,}5 \times 40 = 660{,}0 \times 2$, (to get both sides of the roof,) $= 1320 \times 6 = 7920$ shingles $\times 1\frac{1}{4} \div 1000 = \$9{,}90$.

12. *A.* $300 \times 600 \div 160 = 1125 \times \$15 = \$16875$.

13. *A.* 1×640 square acres $\times \$20{,}75 = \$13280$.

¶ LXXX. Solid or Cubic Measure.

Exercises for the Slate. (p. 224.)

(6.)

$3 \times 8 = 24 \times 2 = 48 \div 5\frac{1}{3}$, (which is done by multiplying the 48 by 3, to bring it into thirds, making 144 thirds, and then dividing 144 by 16, the number of thirds in $5\frac{1}{3}$,)

$= 9$ feet.
$4 \times 8 = 32 \times 2 = 64 \div 5\frac{1}{3} = 12$ feet.
$8 \times 8 = 64 \times 2 = 128 \div 5\frac{1}{3} = \underline{34}$ feet.
A. $\underline{45}$ feet.

(7.)

$8 \times 10 \times 6 \div 144 = 3\frac{1}{3}$
$10 \times 12 \times 15 \div 144 = 12\frac{1}{2}$
$20\frac{1}{2} \times 24 \times 21 \div 144 = \underline{71\frac{3}{4}}$
A. $87\frac{7}{12}$ feet, which is added, by bringing the fractions into a common denominator, by ¶ XLIII., making as follows, viz., $\frac{1}{3} = \frac{4}{12}$, $\frac{1}{2} = \frac{6}{12}$, and $\frac{3}{4} = \frac{9}{12}$, which we add thus: 9 twelfths, and 6 twelfths, and

4 twelfths, make 19 twelfths, = 12 twelfths, or 1 whole, (to carry,) and 7 twelfths, written $\frac{7}{12}$, (to set down.)

8. *A.* 1 mile × 8 × 40 × 5½ × 3 = 5280 feet × 10 feet wide × 3¼ in height = 171600 ÷ 16 cord feet = 10725 cord feet ÷ 8 = 1340⅝ cords.

9. *A.* 30 × 20 × 12 = 7200 sq. inches in one stick, × 2 for 2 sticks, = 14400 ÷ 144 = 100 feet ÷ 50 = 2 tons.

10. *A.* 8 × 4 × 2¼ = 72 solid inches; 240 × 6 × 1½ = 2160 solid feet × 1728 solid inches, (to bring it into solid inches, that we may divide it by 72 solid inches; for we cannot divide feet by inches, but on the contrary, feet by feet, square feet by square feet, square inches by square inches, &c.) = 3732480 ÷ 72 solid inches in each brick = 51840 bricks.

DUODECIMALS.

¶ LXXXI. MULTIPLICATION OF DUODECIMALS.

More Exercises for the Slate. (p. 228.)

(2.)
2 ft. 6′
12 ft. 3′
30 ft. 0′
7′ 6″
A. 30 ft. 7′ 6″.

(3.)
8 ft. 4′
2 ft. 6′
16 ft. 8′
4 ft. 2′
20 ft. 10′
3 ft. 3′
62 ft. 6′
5 ft. 2′ 6″
A. 67 ft. 8′ 6″

(4.)

8 ft. 6′
16 ft. 3′
136 ft. 0′
2 ft. 1′ 6″
138 ft. 1′ 6″ [of the room.
4 to get the 4 sides
552 ft. 6′ = 552,5 ÷ 9 = 61,3888 ÷ 2 (for 50 cts. = ½) = $30,694 +, *A.*

(5.)

4 ft. 3′
4 ft. 6′
17 ft. 0′
2 ft. 1′ 6″
19 ft. 1′ 6″
3 ft.
A. 57 ft. 4′ 6″.

(6.)

7 ft. 4′
1 ft. 3′
7 ft. 4′
1 ft. 10′
9 ft. 2′ = $9\frac{2}{12}$ = $9\frac{1}{6}$ × $1 = $$9\frac{1}{6}$, or $$9,16\frac{2}{3}$, *answer.*

(7.)

17 ft. 7′
1 ft. 5′
17 ft. 7′
7 ft. 3′ 11″
A. 24 ft. 10′ 11″.

(8.)

6 ft. 7′
3 ft. 8′ wide
19 ft. 9′
4 ft. 4′ 8″
24 ft. 1′ 8″
3 ft. 5′
72 ft. 5′ 0″
10 ft. 0′ 8″ 4‴
A. 82 ft. 5′ 8″ 4‴.

(9.)

10 windows × 12 panes × 14′ long × 12′ wide = 20160″.
14 windows × 15 panes × 16′ long × 12′ wide = 40320″ × 2 (because there are 2 stories, each containing that) = 80640″ + 20160″ = 100800″ ÷ 144 = 700 sq. ft., *A.*

(10.)

56 ft. 4′
70 ft.
3943 ft. 4′ = $3943\frac{1}{3}$ × 20 = $$788,66\frac{2}{3}$, *A.*

(11.)

105 ft.

15'

1575'

12'

18900' ÷ 144 = 131, and 36' rem.;
then 36' ÷ 12 = 3', *A.*

Questions on the Foregoing. (p. 228—232.)

1. How many pence are there in 1 s. 6 d.? *A.* 18.
How many cents? *A.* 25.

2. What will 4 yards of cloth cost, in cents, at 1 s. 6 d. per yard? *A.* 1 dollar.
At 3 s. per yard? *A.* $2.
At 4 s. 6 d.? *A.* $3.
At 6 s.? *A.* $4.
At 9 s.? *A.* $6.
At 10 s. 6 d.? *A.* $7.

3. If a man consume 1 lb. 9 oz. of bread in a week, how much would he consume in 1 month? *A.* 7 lbs.

4. At 4 cents for 1 oz., what would 1 lb. cost? *A.* 48 cts.

5. At 4 cents for 2 oz., what would 1 lb. cost? *A.* 24 cts.

6. At 4 cents for 8 oz., what would 2 lbs. cost? *A.* 12 cts.

7. If a man spend $2¼ per day, how many days would he be in spending $4½? *A.* 2 days.
$6¾? *A.* 3 days.
$11¼? *A.* 5 days.
$22½? *A.* 10 days.

8. How many marbles, at 4 cents apiece, must be given for 24 apples, at 2 cents apiece? *A.* 12.

9. How many yards of cloth, at $4 per yard, must be given for 6 bbls. of cider, at $2 per bbl.? *A.* 3 yds.
For 8 bbls.? *A.* 4 yards.
For 12 bbls.? *A.* 6 yards.
For 18 bbls.? *A.* 9 yards.

10. What part of 1 month is 1 day? *A.* $\frac{1}{30}$.
2 days? *A.* $\frac{1}{15}$.
4 days? *A.* $\frac{4}{30}$.
5 days? *A.* $\frac{1}{6}$.
6 days? *A.* $\frac{1}{5}$.
7 days? *A.* $\frac{7}{30}$.
10 days? *A.* $\frac{1}{3}$.
20 days? *A.* $\frac{2}{3}$.
29 days? *A.* $\frac{29}{30}$

11. What is the interest of $1 for 12 mo.? *A.* 6 cts.
10 mo.? *A.* 5 cts.
9 mo.? *A.* 4½ cts.
6 mo.? *A.* 3 cts.
3 mo.? *A.* 1½ cts.
1 mo.? *A.* ½ ct.
15 days? *A.* ¼ ct.

12. What is the interest of $6 for 1 yr. 2 mo.? *A.* $,42.
2 yrs.? *A.* 72 cts.
1 yr. 1 mo.? *A.* 39 cts.
9 mo.? *A.* 27 cts.
2 mo.? *A.* 6 cts.
1 mo.? *A.* 3 cts.
15 days? *A.* 1½ ct.
10 days? *A.* 1 ct.
6 days? *A.* 6 mills.
5 days? *A.* 5 mills.
1 day? *A.* 1 mill.

13. What is the amount of $1 for 6 mo.? *A.* $1,03
3 mo.? *A.* $1,01½.
2 mo.? *A.* $1,01.
1 mo.? *A.* $1,0½.
15 days? *A.* $1,0¼.

14. Suppose I owe a man $115, payable in 2 yrs. 6 mo., without interest, and I wish to pay him now; how much ought I to pay him? *A.* $100.

15. What is the discount of $115, for 2 yrs. 6 mo.? *A. $15.*

16. William has ⅓ of an orange, and Thomas ½; what part of an orange do both own? *A.* ⅚.

17. Harry had ¾ of an orange, which he wished to divide equally between his two little sisters; can you tell me what part of an orange each one would receive? *A.* ¾ ÷ 2 = ⅜ apiece.

18. Which is the most, ,5 of 20, or ,25 of 40? *A.* ,5 = ½, and ,25 = ¼; then ½ of 20 is the same as ¼ of 40.

19. How many times can you draw ½ a gallon of cider from a barrel containing 30 gallons? *A.* 60 times.

How many times ¼ of a gallon? *A.* 120 times.
How many times ⅓ of a gallon? *A.* 90 times.
How many times ⅙ of a gallon? *A.* 180 times.

20. A man, failing in trade, is able to pay his creditors only $,33⅓ on the dollar; how much will he pay on $3? *A.* 1 dollar.

On $4? *A.* $1,33⅓.
On $12? *A.* $4.
On $13? *A.* $4,33⅓.
On $300? *A.* $100.

21. A man, failing in trade, was able to pay only $,16⅔ on the dollar; how much would he pay on a debt of $4? *A.* 66⅔ cents.

$6? *A.* 1 dollar.
$10? *A.* $1,66⅔.
$9? *A.* $1,50.
$20? *A.* $3,33⅓.
$100? *A.* $16,66⅔.
$600? *A.* $100.

22. Two men bought a barrel of flour for $10; one gave $3, and the other $7; what part of the whole did each pay? *A.* $\frac{3}{10}$, and $\frac{7}{10}$

What part of the flour must each have? *A.* $\frac{3}{10}$, and $\frac{7}{10}$.

23. If 30 bushels of oats cost $10, what is that a bushel? *A.* $,33⅓.

What will 5 bushels cost? A. $1,66⅔.

What will 20 bushels? *A.* $\$6,66\frac{2}{3}$.

24. If 3 men mow a field in 8 days, how many men will mow the same in 2 days? *A.* 12 men.

In 1 day? *A.* 24 men.

In 4 days? *A.* 6 men.

25. Two men, A and B, hired a pasture; A paid \$3, and B \$5; what fractional part of the whole did each pay? *A.* $\frac{3}{8}$ and $\frac{5}{8}$.

The profits from the pasture were \$16; what was each man's share of the gain? *A.* \$6 and \$10.

26. Three men, A, B, and C, are engaged in trade: A puts in \$4; B, \$5; and C, \$6: they gained \$60: what is each one's share of the gain? *A.* A, \$16; B, \$20; and C, \$24.

27. Two men, A and B, hired a pasture for \$12; A put in 1 cow 4 months, and B, 2 cows 3 months; what ought each to pay? *A.* A, \$4,80, and B, \$7,20.

28. A merchant, having purchased a piece of broadcloth for \$2 per yard, wishes to make 20 per cent. on it; what price must he ask for it? *A.* \$2,40.

29. William has $\frac{1}{8}$ of a dollar, Thomas $\frac{1}{16}$, and Harry $\frac{1}{6}$; how many cents have they in all? *A.* $12\frac{1}{2}+16\frac{2}{3}+6\frac{1}{4}$ cts. $=35\frac{1}{2}$ cts., nearly.

30. A merchant sold calico at \$,22 per yard, and thereby gained 10 per cent.; what did it cost him per yard? *A.* 20 cents.

31. Harry, having $\frac{3}{4}$ of an orange, gave $\frac{1}{5}$ to Thomas, who gave $\frac{1}{2}$ of his part to his little brother, and kept the remainder himself; what part did he keep? *A.* $\frac{1}{5}\times\frac{3}{4}=\frac{3}{20}$, Thomas's. $\frac{3\times1}{20\times2}=\frac{3}{40}$, he gave to his brother, and, of course, kept the other half, which must be $\frac{3}{40}$, also.

How much is $\frac{1}{5}$ of $\frac{3}{4}$? *A.* $\frac{3}{20}$.

How much does $\frac{1}{2}$ of $\frac{1}{5}$ of $\frac{3}{4}$ from $\frac{3}{20}$ leave? *A.* $\frac{1}{2}\times\frac{1}{5}\times\frac{3}{4}=\frac{3}{40}$, subtracted from $\frac{3}{20}$ $(=\frac{6}{40})$ leaves $\frac{3}{40}$.

32. ***How*** much is $1\times\frac{2}{3}$ of $\frac{3}{2}$? *A.* 1.

How much is 1 × $\frac{6}{7}$ of $\frac{7}{6}$? *A.* 1.

33. What is the quotient of $\frac{2}{3}$ divided by $\frac{3}{2}$? *A.* $\frac{2\times2}{3\times3}=\frac{4}{9}$.

34. How much does $\frac{3}{4}$ exceed ,75? *A.* Equal.

35. How much does $\frac{4}{5}$ exceed $\frac{7}{11}$? *A.* $\frac{4}{5}=\frac{44}{55}$, and $\frac{7}{11}=\frac{35}{55}$, subtracted from $\frac{44}{55}=\frac{9}{55}$.

36. How many strokes does a regular clock strike in 2 hours? *A.* 2 + 1 = 3.

3 h.? *A.* 1 + 2 + 3 = 6.

4 h.? *A.* 1 + 2 + 3 + 4 = 10.

5 h.? *A.* 15.

6 h.? *A.* 21.

7 h.? *A.* 28.

8 h.? *A.* 36.

9 h.? *A.* 45.

10 h.? *A.* 55

11 h.? *A.* 66.

12 h.? *A.* 78.

24 h.? *A.* 156.

37. How many square feet in a board 12 inches wide, and 48 inches long? *A.* 4 sq. ft.

36 in. long? *A.* 3.

72 in. long? *A.* 6.

38. What part of an acre of land is there in your father's garden, allowing it to be 4 rods long, and 2 rods wide? *A.* $\frac{1}{20}$.

4 rods wide? *A.* $\frac{1}{10}$.

39. How many cord feet of wood are contained in a load 3 feet wide, 2 feet high, and of the usual length? *A.* 3 cord feet.

How many feet in a load 6 feet high, and 3 feet wide? *A.* 9.

2 feet high, and 6 feet wide? *A.* 6.

4 feet high, and $2\frac{1}{2}$ feet wide? *A.* 5.

40. How many solid feet in a block 12 inches long, 12 inches wide, 12 inches thick? *A.* 1 solid foot.

12 inches long, 12 inches wide, and 6 inches thick? *A.* ½ solid foot.

41. How long will it take to count $1000, at the rate of 50 a minute? *A:* 20 minutes.

42. What is the difference between 4 square feet, and 4 feet square? *A.* 12 square feet.

10 miles square and 10 square miles? *A.* 90 square miles.

3 rods square, and 3 square rods? *A.* 6 square rods.

A parenthesis, enclosing several numbers, signifies that these numbers are to be taken together, or as one whole number; but, when performing subtraction and addition with these and other numbers, they may be taken either as before, or one by one, thus:—

(16 + 4) × 3 = 60, read 16 + 4 = 20 × 3 = 60;
or, (16 × 3) = 48; 4 × 3 = 12; then 48 + 12 = 60, the same as before.

43. (9 + 3) + 8 = how many? *A.* 20.
44. (9 — 3) — 4 = how many? *A.* 2.
45. (15 + 5) × 4 = how many? *A.* 80, or 60 + 20.
46. (15 — 5) × 4 = how many? *A.* 40, or 60 — 20.
47. (9 + 3) ÷ 3 = how many? *A.* 4, or 3 + 1.
48. (9 — 3) ÷ 3 = how many? *A.* 2, or 3 — 1.
49. (12 — 8) ÷ (3 + 1) = how many? *A.* 1, or 3 — 2.

A line, or vinculum, drawn over numbers, is sometimes used instead of a parenthesis.

50. $\overline{4+8} \times 12$ = how many? *A.* 144, or 48 + 96.
51. $\overline{2\text{£}.\ 4\text{ s.}} \times 2$ = how much? *A.* 4£. 8 s.
52. (2 s. 6 d.) × 2 = how much? *A.* 5 s.
53. (7 s. 6 d.) × 4 = how much? *A.* 1£. 10 s.
54. $\overline{3 \times 3} \times 2 \times 10$ = how many? *A.* 180.

55. How many minutes of motion make two degrees of motion? *A.* 120 minutes.

How many seconds of motion make 3 minutes of motion? *A.* 180 seconds.

56. How many degrees is the circumference of the earth? *A.* 360 degrees.

The earth, you know, turns round once in every 24 hours, or, in common language, the sun moves round the earth in that time; in what time, then, will the sun travel over 15° (degrees)? and why? *A.* 1 hour; for 360° ÷ 24 h. = 15°.

58. In what time will he travel over 1° (degree) of motion? *A.* $\frac{1}{15}$ of 1 hour, or $\frac{1}{15}$ of 60 min. = 4 minutes.

59. In what time will he travel over 1′ (minute) of motion? *A.* $\frac{1}{15}$ of 1 min., or $\frac{1}{15}$ of 60 sec. = 4 seconds.

Q. By the foregoing, we see that every degree of motion makes a difference in time of 4 minutes, and every minute of motion, a difference of 4 seconds. Now, since longitude is reckoned in degrees, round the earth, can you tell me how to find the difference in time between one place and another, after knowing their difference in longitude?

A. Multiply the difference of longitude, in degrees and minutes, by 4; the product will be their difference in time, in minutes and seconds.

60. What is the difference in time between two places, whose difference in longitude is 2° 4′? *A.* $\overline{2^\circ\ 4'}$ = 8 minutes and 16 seconds, the difference in time.

61. What is the difference in time between two places, whose difference in longitude is 5° 10′? *A.* 20 m. 40 sec.

What, when the difference of longitude is 8°? *A.* 32 m.

Is 10°? *A.* 40 m.

Is 15°? *A.* 60 m., = 1 hour.

Is 15° 15′? *A.* 1 h. 1 m.

Q. The sun travels from east to west; which place, then, will have the earliest time?

A. The one most easterly.

62. There are two places, the one situated in 10° E. longitude, and the other in 4° E. longitude; what is the difference in time between these two places? When it is 24 minutes past 6 o'clock in the former, what hour is it in the latter?

A. 24 minutes, difference in time; then, 10° being the most easterly place, it is there 24 minutes earlier than at 4°; that is, when it is 24 minutes past 6 at 10°, it is only 6 at 4°.

63. Boston is situated about 6° 40′ E. longitude from the city of Washington; when it is 2 o'clock at Washington, what o'clock is it at Boston? *A.* 26 m. 40 sec. past 2 o'clock.

64. "I recollect of reading a story once of a gentleman going to a foreign country, who had a fancy to look at a bright star every evening, at the same moment with a certain lady whom he left behind, and they agreed to look at it at 9 o'clock." But it seems, that, when the gentleman was in a different longitude, the time would, of course, be different; as, for instance, when he was in longitude differing 30° W. from where the lady was, she most probably had retired to rest, and was, perhaps, asleep, while he was gazing at the star. Can you tell me what o'clock it was, then, where she was? *A.* 11 o'clock.

When he was 60° of W. longitude from her, what hour of the night was it at the place where the lady resided? *A.* 1 o'clock.

Exercises for the Slate. (p. 233—241.)

1. *A.* 3,303,303.

2. *A.* 50 eagles = 5000 dimes — 4599 = 401 dimes, = $40,10.

3. *A.* 65 × 42 = 2730.

(4.)

$7002 ÷ 100 = $70,02, for 1 share.

$70,02 × 12 .... = $840,24, captain's

$70,02 × 5 = $350,10 (for 1 lieutenant; then double it for both).... = $700,20

$1540,44.

A. $7002 — 1540,44 ÷ 30 = $182,052, for each seaman

5. *A.* 400 × 6 × 12 = 2880; 6 s. 8 d. = 80 d.; 2880 ÷ 80 = 360 crowns.

6. *A.* 1827 — 1732 = 95 yrs. × 365¼ = 34698¾ days, × 24 = 832770 hours, × 60 = 49966200 minutes, × 60 = 2997972000 seconds.

7. *A.* 360 × 69½ = 25020 miles, × 8 = 200160 furlongs, × 40 = 8006400 rods, × 5½ = 44035200 yds. × 3 = 132105600 ft. × 12 = 1585267200 inches, ÷ 60 in. (= 5 ft.) = 26421120; 1585267200 ÷ 27 = 58713600 — 26421120 = 32292480 times round the earth; ÷ 3 = 10764160 times through the earth.

8. *A.* 1827 × 365¼ = 667311¾ days, × 24 = 16015482 hours, × 60 = 960928920 minutes.

9. *A.* 14 yrs. × 12 × 4 = 672 × 7 × 24 = 112896 × 60 = 6773760 minutes.

10 yrs. 10 mo. 10 wks. 10 da. 10 h. 10 min.
12
130 × 4
530 × 7
3720 × 24
89290 × 60
5357410.

6773760
5357410
A. 1416350 min.

10. *A.* $\frac{492}{744}$ ÷ 12 = $\frac{41}{62}$.

11. *A.* 3 × 4 ÷ 7 = 1 qr. and 5 rem.; 28 × 5 ÷ 7 = 20 lbs.

(12.)

$$\begin{array}{r} ,5 \\ ,05 \\ ,005 \\ ,555 \\ ,18765 \\ \underline{8567,} \\ \text{A. } \underline{8568,29765,} \end{array}$$

13. *A.* $\frac{2}{81} \times \frac{41}{3} = \frac{82}{243}$.

14 Omit the 17, and join it to $\frac{5}{7}$, reduced to a common denominator, but retain the 14, because only a part of it is to be subtracted. $14\frac{1}{2} = \frac{29}{2}$; then $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{29}{2} = \frac{58}{12}$, $= \frac{406}{84}$, and $\frac{5}{7} = \frac{60}{84}$, and $\frac{406}{84} = 4\frac{70}{84}$, and joining 17 to $\frac{60}{84}$, $= 17\frac{60}{84}$; then $17\frac{60}{84} - 4\frac{70}{84}$, by saying, $\frac{70}{84}$ from $\frac{60}{84}$, we can't, but $\frac{70}{84}$ from $\frac{84}{84}$, leaves $\frac{14}{84} + \frac{60}{84} = \frac{74}{84}$, and 1 to carry to 4 makes 5; then 5 from 17 leaves 12. *A.* $12\frac{74}{84}$.

15. *A.* $550 \div 12 = 45\frac{10}{12}$.

16. *A.* × 20 × 12 d. = 8 s. 6 d.

17. *A.* ÷ 4 qrs. ÷ 12 d. ÷ 20 s. = ,7281 +.

(18.)

$$\begin{array}{r} ,1 \\ \underline{-\,,0678} \\ \underline{,0322}\text{, A.} \end{array}$$

19, *A.* \$60 ÷ 25 = \$2,40.

(20.)

$$\begin{array}{r} 6 \times 15 \times 40 = 3600 \\ 2 \times 12 \times 27 = \underline{648} \\ \underline{4248} \times 1\frac{1}{4} = \$5310\text{, A.} \end{array}$$

(21.)

$10024 × $\frac{3}{8}$ = 3759, wife's; which, subtracted from $10024 = $6265 × $\frac{2}{5}$ = $2506, eldest son's: then $3759 + $2506 = $6265, which, subtracted from $10024 = $3759, to his youngest son.

(22.)

$$\left.\begin{array}{r}20 \times ,75 = \$15 \\ 200 \times ,10 = \$20\end{array}\right\} = \$35,00$$

$$\begin{array}{lr}20 \times 22 & = \underline{\$\ 4,40} \\ & A.\ \underline{\$30,60.}\end{array}$$

23. *A.* 150 × 25 = $37,50 ÷ 50 cts. = 75 yds.
24. *A.* 500 × $2½ ÷ 600 = $2,083 +.

(25.)

$$\left.\begin{array}{ll}\text{Apples,} \ldots\ldots & \$24,00 \\ \text{Corn,} \ldots\ldots\ldots & \$27,00 \\ \text{Cheese,} \ldots\ldots & \$40,00 \\ \text{Butter,} \ldots\ldots & \$34,00 \\ \text{Turnips,} \ldots\ldots & \$14,25 \\ \text{Barley,} \ldots\ldots & \$50,00 \\ \text{Rye,} \ldots\ldots\ldots & \$23,75\end{array}\right\} = \$213,00$$

$$\left.\begin{array}{ll}\text{Brandy,} \ldots\ldots & \$26,46 \\ \text{Flour,} \ldots\ldots\ldots & \$35,00 \\ \text{Molasses,} \ldots & \$20,40 \\ \text{Wine,} \ldots\ldots\ldots & \$60,00 \\ \text{Tea,} \ldots\ldots\ldots & \$\ 7,30 \\ \text{Cash,} \ldots\ldots\ldots & \$40,00\end{array}\right\} = \underline{\$189,16}$$

$23,84 ÷ 7 =

A. 340 lbs. and 4 rem. × 16

64 ÷ 7

9 oz. 1 × 16

16 ÷ 7

2$\frac{2}{7}$ drams.

(26.)

A. $2 \text{ bbls.} \times 31\tfrac{1}{2} = 63 \text{ gals.} \times 2 \div \$1,20 = 105 \text{ bbls.}$

(27.)

$$\begin{array}{r} 40 \times 1\tfrac{1}{2} = \$60 \\ 200 \times 25 = \underline{\$50} \\ A.\ \underline{\$10.} \end{array}$$

(28.)

A's Sales.

$$\left.\begin{array}{l} \text{Sugar, } \ldots\ldots \$\ 147,84 \\ \text{Flour, } \ldots\ldots \$\ 225,00 \\ \text{Tea, } \ldots\ldots \$8072,96 \\ \text{Rice, } \ldots\ldots \$1080,00 \end{array}\right\} = \$9525,80$$

B's.

$$\begin{array}{ll} \left.\begin{array}{l} \left.\begin{array}{l} \text{Note, } 79\tfrac{1}{2} \text{ mo.} \div 2 = 39\tfrac{3}{4} \\ \times\ 400 = \$159 + 400 \end{array}\right\} = \$559 \\ \text{Candles } \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ \$798 \end{array}\right\} = & \underline{\$1357,00} \\ & \underline{\$8168,80.} \end{array}$$

$\$1 \times 5\tfrac{1}{2} \times 2\tfrac{1}{2} = \$,1375 + \$1 = 1,1375$, amount; then $\$8168,80 \div 1,1375 = \$7181,362 +$, *A.*

(29.)

$$\begin{array}{r} 200 \times 10\tfrac{1}{2} = \$2100 \\ -\ \underline{\$1090} \\ \underline{\$1010,00 \div ,20 \text{ cts.}} \\ \underline{5050 \text{ gals.} \div 63} \\ A.\ \underline{80 \text{ hhds. } 10 \text{ gals.}} \end{array}$$

31. *A.* \$20 : \$5 : : \$25 : \$6,25.

32. *A.* $\tfrac{3}{4} \div 15$ (*To divide a fraction by a whole number, we may divide the numerator by it, or multiply the denominator by it.*) $= \tfrac{3}{60} = \tfrac{1}{20}$.

33. *A.* $\tfrac{1}{20} \times 15 = \tfrac{15}{20} = \tfrac{3}{4}$.

34. *A.* ,25 ÷ ,625 = ,4.

(35.)

For $150, 200 bushels.
For $600, 800 bushels.
For $ 75, 100 bushels.
A. 1100 bushels.

36. *A.* (800 added to 12 and to 88,) and then divided by 50,5 = 20.

37. *A.* 80 divided by 16 = 5, and which, added to the quotient, 2, of 144 divided by 72, makes 7, divided by the difference between 3,55 and ,55 (which is 3), makes 2$\frac{1}{3}$.

(38.)

$$40 \times 10 = 400$$
$$35 \times 10 = 350$$
A. 50.

400 + 350 = 750 miles, *A.*

(39.)

$$\left.\begin{array}{r} 700 \times 8 = 5600 \\ 1280 \times 10 = 12800 \end{array}\right\} \begin{array}{l} 18400 : 5600 :: 500 \\ 18400 : 12800 :: 500 \end{array} \left.\right\} \begin{array}{l} \$159,173, \text{ A's} \\ \$347,826, \text{ B's.} \end{array}$$

(40.)

4 ft. 6′ = 4$\frac{1}{2}$ = $\frac{9}{2}$, and 5 ft. 3′ = 5$\frac{1}{4}$ = $\frac{21}{4} \times \frac{9}{2} = \frac{189}{8} \div 2 = \frac{189}{16}$ = 11$\frac{13}{16}$, *A.*

OR

4 ft. 6′
5 ft. 3′
22 ft. 6′
1 ft. 1′ 6″
2) 23 ft. 7′ 6″
A. 11 ft. 9′ 9″

(41.)

For $40^\circ \times 4 \div 60 = 2$ h. 40 m.
For $50^\circ \times 4 \div 60 = 3$ h. 20 m.
For $60^\circ \times 4 \div 60 = 4$ h. 0 m.
A. 10 h.

(42.)

A. $15 + 15 = 30^\circ \times 4$ m. $= 120$ m. $= 2$ hours earlier than 6 o'clock, which is 4 o'clock.

(43.)

A. $16 \times 240 = 3840 \div 20 = 192 \div 4$ (25 cts.) $=$ \$48,00; $192 \times 10 \times 8\frac{1}{4} =$ \$158,40 — \$48, $=$ \$110,40.

(44.)

A. 40 : 10 :: 4 : 1 week.

(45.)

\$2,75 × 126 = \$346,50
\$315,00
A. Whole gain, \$ 31,50 ÷ 126
25 cts.

315,00 ÷ 126 = \$2,50, cost; $\frac{25}{250}$ = ,01 per cent.

OR

$$\left.\begin{array}{l}\dfrac{31{,}50\text{, whole gain,}}{315{,}00\text{, whole cost,}}\end{array}\right\} = 01 \text{ per cent.}$$

(46.)

Expenses.

Rent,	$500,00	= $1055,01.
Labor,	$184,00	
Clothes,	$ 17,50	
Board,	$ 11,16	
Sheep,	$200,00	
Expenses,	$142,35	

Sales.

Skins,	$*45,00	= $2393,98
Potatoes,	$420,00	
Barley,	$148,50	
Beans,	$ 35,20	
Corn,	$212,00	
Rye,	$276,00	
B. Wheat,	$159,03	
Oats,	$ 56,00	
Cheese,	$575,00	
Butter,	$ 90,00	
Clover,	$ 8,00	
Turnips,	$ 8,60	
W. Apples,	$ 33,60	
F. Seed,	$ 17,50	
Wool,	$180,00	
Calves,	$ 90,00	
Cider,	$ 39,55	

— $1055,01

Profit, $1338,97, *A.*

½ of 70 = 35 bbls. × 31½ = 1002,5 gals. × 4 qts. ÷ 4 = 1002½ qts. cider brandy.

---

* Found among the expenses, where the loss of the sheep is estimated.

(47.)

8 yrs. = 96 mo. ÷ 2 = 48 × 10000 = $4800, Simple interest.

$10,000 × 6

600,00

10000

10600 × 6

636,00

10600

11236 × 6

674,16

11236

11910,16 × 6

714,6096

11910,16

12624,7696 × 6

757,486176

12624,7696

13382,255776 × 6

802,93534656

13382,255776

14185,19112256 × 6

851,1114673536

14185,19112256

15036,3025899136 × 6

902,178155394816

15036,3025899136

15938,480745308416

10000

C. interest, 5938,480745308416

S. interest, 4800

A. 1138,48 +.

(48.)

$1 for 4 yrs. amounts to $1,24; $500 ÷ 1,24 = $403,225, subtracted from $500, leaves $96,775 discount.

$500 × 6

30,00

500

530 × 6

31,80

530

561,80 × 6

33,7080

561,80

595,5080 × 6

35,730480

595,5080

631,238480

500

C. interest, 131,238480

Discount, 96,775

A. 34,463 +.

(49.)

$1800 ÷ $1,18 = $1525, 423, present worth.

1800 × 6

108,00

1800

1908,00 × 6

114,48

1908

2022,48 × 6

121,3488

2022,48

2143,8288

1525,423

A. = $ 618,405, Differ.

(50.)

35 + 65 = 100 run out, which, subtracted from 120, that runs in, leaves 20 *in* every hour.

20 gals. : 600 gals. : : 1 h. : 30 h., *A.*

(51.)

	Cost.	*Sale.*
Sugar, ...	$ 22,125, ...	$0,07
Tea, ...	$ 20,000, ...	$5,75
Coffee, ...	$ 70,000, ...	$0,40
Pork, ...	$160,000, ...	$0,09
Beef, ...	$182,000, ...	$0,08
Hams, ...	$187,200, ...	$0,15
Amount, carried forward.	$641,325, ...	$6,54

	Cost.	*Sale.*
Amount, brought forward,	$641,325,	$6,54
Tallow,	$ 20,000,	$0,11½
Rum,	$ 32,760,	$0,30
Molasses,	$ 15,120,	$0,28
Brandy,	$ 29,680,	$1,29
Brandy,	$ 73,080,	$1,33
Wine,	$ 94,350,	$0,98
Wine,	$252,000,	$1,15
Gin,	$ 75,600,	$0,69
Vinegar,	$ 5,906,	$0,29
Barrels,	$ 30,000,	$0,86
Hogsheads,	$ 70,560,	$1,29
Calico,	$ 6,160,	$0,25
Silk,	$ 24,920,	$1,02
Cotton,	$ 1,610,	$0,16
C. Plaid,	$ 2,280,	$0,22
Linen,	$ 4,600,	$0,53
Broadcloth,	$ 32,130,	$1,37
B. Broadcloth,	$ 56,250,	$4,31
Mixed do.,	$ 11,000,	$1,26½
Satin,	$ 46,375,	$1,01
Vesting,	$ 3,200,	$0,92
Hats,	$ 8,680,	$2,49½
Shoes,	$ 10,800,	$2,07
C. Shoes,	$ 2,640,	$0,25
Whips,	$ 15,960,	$1,31
Hoes,	$ 11,620,	$0,95
Axes,	$ 14,040,	$1,34½
Axe-Helves,	$ 1,050,	$0,08
Pails,	$ 6,210,	$0,26
Tubs,	$ 20,700,	$0,53
Kettles,	$ 29,500,	$3,39
Knives,	$ 4,080,	$0,19½
Snuff,	$ 1,440,	$0,41
Ploughs,	$ 7,000,	$4,02½
Amount, carried forward,	$1662,626,	$43,48

	Cost.	*Sale,*
Amount, brought forward,	$1662,626,...	$43,48
Rakes,............	$0,880,....	$0,25
H. Books, ...	$0,760,....	$0,44
S. Books,..........	$0,720,....	$0,21
D. Geography,......	$0,320,....	$0,18
M. Geography,......	$1,200,....	$1,38
G. Coats, ...	$4,000,....	$2,30
Vest, ...	$0,500,....	$0,57½
Amount of Stock,...	$1671 +	$48,81½

To deduct 15 per cent., we may multiply by 15 per cent., and subtract the product from $1671; or we may multiply by 100 — 15 = 85 per cent. × by 1671 = $1420,35.

Wages, 24 × 26 = $624.

500 × 6
30,00
500
530 × 6
31,80
530
561,80 × 6
33,7080
561,80
595,5080 × 6
35,730480
595,5080
631,238480 × 6
37,87430880
631,238480
$669,112 +, Note.
624....... Wages.
$1293,112, which we subtract from

$1420,35 (the actual cost of goods), = $127,238, ÷ 1,36 = $93,557, *A.*

(51—*continued.*)

Rent, ... $29,000
C. Hire, ... $27,814
Interest, ... $85,221

$142,035, which is 10 per cent. on $1420,35; then 5 per cent. more makes 15 per cent. advance. Therefore, multiply the cost of the articles found in the foregoing inventory by 115. The answers to each are, in this work, annexed to the cost of each in the aforesaid inventory. Taking the first article, for example, thus:—

Sugar, $0,06¼, cost.
115
$,07,1875 = 7 cts. +, *A*.

53. *A*. 10 — 8 = 2 miles gain in one hour.
2 miles gain : 30 miles to gain : : 1 h. = 15 hours.

54. *A*. At four o'clock, the hour hand will be four spaces forward of the minute hand. In one hour, the minute hand passes over twelve spaces, while the hour hand passes over one space. The question then is, How long will it take to gain four spaces, if it take one hour to gain eleven spaces? Hence, as 11 spaces : 4 spaces : : 60 minutes : $21\frac{1}{11}$ (minutes).

55. *A*. When the hands are together, it is evident that the minute hand must gain twelve spaces before they can be together again. Hence, as before, as 11 spaces : 12 spaces : : 60 minutes : 65 min. $27\frac{3}{11}$ sec. = 1 hour 5 min. $27\frac{3}{11}$ sec.

(56.)

The less time, the more men; and the greater the work the more men.

$$\left.\begin{array}{l}5 \text{ days} : 25 \text{ days} \\ 1 \text{ do.} : \ 4 \text{ do.}\end{array}\right\} : 10 \text{ men.}$$

$25 \times 4 \times 10 = 1000 \div 5 = 200$ men, *A*.

57. *A.* $\frac{1}{8}$ and $\frac{1}{12}$, reduced to a common henominator, $= \frac{3}{24} + \frac{2}{24} = \frac{5}{24}$. (*For the rest of the work, see the Arithmetic.*)

58. *A.* $\frac{2}{3}$ and $\frac{1}{4} = \frac{8}{12}$, and $\frac{3}{12}$, added together, make $\frac{11}{12}$.

59. *A.* $\frac{2}{3} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}$.

60. *A.* $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{5}{2} = \frac{15}{16} + \frac{10}{16} (= \frac{5}{8}) = \frac{25}{16} = 1\frac{9}{16}$.

61. *A.* $\frac{2 \times 8}{3 \times 9} = \frac{16}{27}$.

62. *A.* $3\frac{1}{8} = \frac{25}{8} \times \frac{5}{4} = \frac{125}{32} = 3\frac{29}{32}$.

65. *A.* $1 = \frac{1}{1}$, or $\frac{2}{2}$, or $\frac{3}{3}$, &c. Then $\frac{1}{2}$ of $\frac{2}{2} = \frac{2}{4} + \frac{2}{2}$ (or $\frac{4}{4}$) $= \frac{6}{4}$; then, as many times as $\frac{6}{4}$ is contained in 18, so many times greater will be the true number. $18 \times 4 = 72$ qrs. $\div$ 6 qrs. $= 12$.

66. *A.* $\frac{1}{8} + \frac{2}{8} + \frac{4}{8} = \frac{7}{8}$ from $\frac{8}{8} = \frac{1}{8}$, for D's part, which is \$100; and $\frac{1}{8} =$ \$100, for A; $\frac{2}{8} =$ \$200, for B; $\frac{4}{8} =$ \$400, for C.

67. *A.* $\frac{5}{16} + \frac{9}{16} = \frac{14}{16}$, from $\frac{16}{16}$, the whole, leaves $\frac{2}{16}$, which is 2 feet, and therefore $\frac{1}{16}$ is 1 foot, and $\frac{16}{16}$ is 16 feet.

68. *A.* If $\frac{5}{12}$ is 1000, $\frac{1}{12}$ is 200, and $\frac{12}{12}$ is twelve times $200 = 2400$.

69. *A.* If 12 feet is $\frac{1}{18}$, then $\frac{18}{18}$, or the entire length of the mast, is 18 times 12, $= 216$ feet.

70. *A.* $\frac{1}{2}, \frac{1}{4}, \frac{1}{6} = \frac{6}{12} + \frac{3}{12} + \frac{2}{12} = \frac{11}{12}$; then $\frac{1}{12}$ more is $40 + 10 = 50$, and $\frac{12}{12}$, 12 times 50, $= 600$.

71. *A.* $\frac{1}{3}, \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$, from $\frac{12}{12}$, leaves $\frac{5}{12}$, the remainder, which is 20 years; then $\frac{1}{12}$ is $\frac{1}{5}$ of $20 = 4$ yrs., and $\frac{12}{12}$, or his whole life, 12 times 4, $= 48$.

72. *A.* $\frac{1}{8}, \frac{1}{3}, \frac{1}{2} = \frac{3}{24} + \frac{8}{24} + \frac{12}{24} = \frac{23}{24}$; therefore, $\frac{1}{24}$ learn to read, which is 10; then $\frac{24}{24}$ is 24 times $10 = 240$, the whole number, and $\frac{1}{8}$ is $\frac{1}{8}$ of $240 = 30$, in Geography; $\frac{1}{3}$ of 240 is 80, in Grammar; and $\frac{1}{2}$ of 240 is 120, in Arithmetic.

73. *A.* $100 - 7\frac{1}{2} = 92\frac{1}{2} = 92{,}5$; $\frac{2}{2}, \frac{4}{2} + \frac{1}{2} = \frac{5}{2}$; then $\frac{1}{2}$ is $\frac{1}{5}$ of $92{,}5 = 18{,}5$, and $\frac{2}{2}$, or the number 2 times 18,5, $= 37$.

74. *A.* Let the number be expressed by $\frac{2}{2}$; then, as many more is $\frac{2}{2}$, and one half as many more, is $\frac{1}{2}$; all which make, when added together, $\frac{5}{2}$, which is equal to 92,5 (for $7\frac{1}{2}$ from

100 = $92\frac{1}{2}$ = 92,5). Then $\frac{1}{2} = \frac{1}{5}$ of 92,5 = 18,5, and 2 halves = 2 × 18,5 = 37.

(75.)

A. If 36 is $\frac{9}{40}$, then $\frac{1}{40}$ is $\frac{1}{9}$ of 36 = 4, and $\frac{40}{40}$ is 4 × 40 = 160.

(76.)

A. Let the number be $\frac{60}{60}$, to correspond with the common denominator of the succeeding fractions. $\frac{1}{5}, \frac{1}{3}, \frac{1}{4} = \frac{12}{60}, \frac{20}{60}, \frac{15}{60}$. Then $\frac{60}{60}$, the number, $+ \frac{12}{60} + \frac{20}{60} + \frac{15}{60} = \frac{107}{60}$, which must, of course, be equal to 131; therefore, $\frac{1}{60}$ is 131 ÷ 60 = $1\frac{24}{107}$, and $\frac{60}{60}$, or the number, is 60 times $1\frac{24}{107}$, = $73\frac{49}{107}$.

(77.)

10 miles = 3200 rods.
1 hour = 3600 seconds.
3600 sec. : 45 sec. : : 3200 rods.

3200 × 45 = 144000 ÷ 3600 = 40 rods gain, + 12 rods start, = 52 rods, *A*.

(78.)

6 miles = 1920 rods.
1 hour = 3600 seconds.
1920 rods : 52 rods : : 3600 seconds.
3600 × 52 = 187200 ÷ 1920 = $97\frac{1}{2}$ seconds, *A*.

(79.)

Having ascertained, by the two former examples, that, on these very conditions, it will take the dog $97\frac{1}{2}$ seconds to overtake the hare, we therefore make the following statement:—

16 miles = 5120 rods.
hour = 3600 seconds,

3600 sec. : $97\frac{1}{2}$ sec. : : 5120 rods.
$97\frac{1}{2}$
2560
35840
46080
36,00) 4992,00 (138
36
139
108
312
288
24 × $5\frac{1}{2}$
132 ÷ 36
3 yds., and 24 × 3
72 ÷ 36
2 feet.

A. 138 rods, 3 yds. 2 feet

(80.)

365 × 20 = $73,00 a year, to the poor.
90 guineas × 28 s. ÷ 6 = $420 + $73 = 493.
$2000 — 493 = $1507 ÷ 365 = $4,128, *A*.

(81.)

120 d., or 4 mo.	$600 × 2	= $ 12,00
2 days.	$600 × $\frac{1}{30}$	= $ 0,20
10 yrs. 10 mo. 10 d.	$600 × $65\frac{1}{6}$	= $391,00
5 yrs. 5 mo. 5 d.	$600 × $32\frac{1}{2}$ & $\frac{1}{12}$	= $195,50
6 yrs. 6 mo. 6 d.	$600 × $39\frac{1}{10}$	= $234,60
4 yrs. 4 mo. 4 d.	$600 × $26\frac{1}{15}$	= $156,40
		A. $989,70.

(82.)

2 yrs. 6 mo. $= 30$ m. $\div 2 = 15$; then $\$1 \times 15$, amounts to $\$1{,}15$.

$$\$3000 \div 1{,}15 = \$2608{,}695+, \text{ A.}$$

(83.)

$$\begin{array}{rcr} \$200 \times 4 & = & \$800 \\ \$400 \times 8 & = & \$3200 \\ \underline{\$400} \times 12 & = & \underline{\$4800} \\ \underline{\underline{\$1000}} &) & \underline{\$8800} = 8\tfrac{4}{5} \text{ mo., A.} \end{array}$$

(84.)

8 in. long × 4 in. wide × $2\frac{1}{2}$ in. thick $= 80$ solid inches in 1 brick.

$$\begin{array}{rl} \text{Length, } 83 & \text{ft., 1 ft. being deducted for the end.} \\ \text{Height, } \underline{\times 20} & \\ 1660 & = 1 \text{ side.} \\ \underline{2} & \text{for 2 sides.} \\ 3320 & \text{ft., in the 2 sides.} \\ \text{Width, } 39 & \text{ft, 1 ft. being deducted for the end.} \\ \text{Height, } \underline{20} & \text{ft.} \\ 780 & \text{ft.} \\ \underline{2} & \text{for 2 ends.} \\ 1560 & \text{ft. in the 2 ends.} \\ \underline{3320}, & \text{in the 2 sides.} \\ 4880, & \text{solid feet in all the sides.} \\ \underline{1728} & \\ 39040 & \\ 9760 & \\ 34160 & \\ \underline{4880} & \\ 8|0\ )\ \underline{843264|0} & \\ \text{A. } \underline{105408} & \text{bricks.} \end{array}$$

APPENDIX.

ALLIGATION.

¶ LXXXII. Alligation Medial. (p. 242.)

2. *A.* $10 \times 10 = 100$; $4 \times 4 = 16$; $8 \times 7\frac{1}{2} = 60$: and $100 + 16 + 60 = 176$, and $10 + 4 + 8 = 22$. Then $176 \div 22 = \$8$, the worth of 1 cwt.; and $8 \times 5 = \$40$, the worth of 5 cwt.

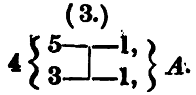
3. *A.* $5 \times 125 = 625$; $9 \times 180 = 1620$; $17 \times 150 = 2550$. Then $6{,}25 + 16{,}20 + 25{,}50 = 47{,}95$; and $5 + 9 + 17 = 31$, and $47{,}95 \div 31 = \$1{,}546 +$.

4. *A.* $20 \times 135 = 2700$; $15 \times 85 = 1275 + 2700 = 3975$. Then $20 + 15 = 35$, and $3975 \div 35 = \$1{,}135 +$.

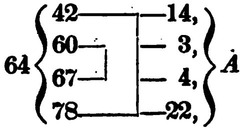
5. *A.* $4 \times 23 = 92$; $2 \times 17 = 34 + 92 = 126$. Then $4 + 2 = 6$, and $126 \div 6 = 21$.

Alligation Alternate. (p. 244, 245.)

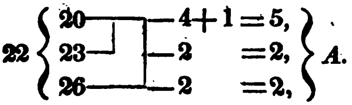
(3.)



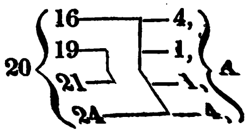
(4.)



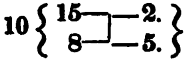
(5.)



(6.)

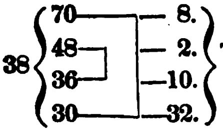


(7.)



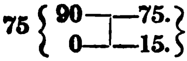
Then, as 2 : 5 : : 1 : 2½.

(8.)



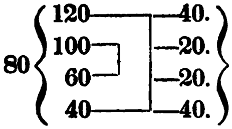
Then, as
8 : 2 : : 10 : 2½ bu. rye,
8 : 10 : : 10 : 12½ do. corn,
8 : 32 : : 10 : 40 do. bar., *A.*

(9.)



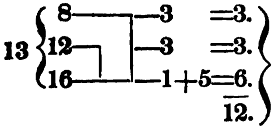
Then, as 75 : 15 : : 100 : 20 gals. water, *A*

(10.)



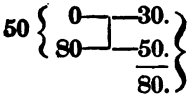
Then, as
40 : 40 : : 20 : 20, at $1,20,
40 : 20 : : 20 : 10, at $1,00,
40 : 20 : : 20 : 10, at $0,60, *A.*

(12.)



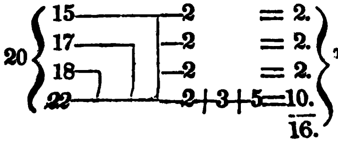
Then, as
12 : 3 : : 120 : 30, at 8,
12 : 3 : : 120 : 30, at 12,
12 : 6 : : 120 : 60, at 16, *A*

(13.)



Then, as
80 : 50 : : 90 : 56¼ gals. wine,
80 : 30 : : 90 : 33¾ do. water, *A*

(14.)



Then, as
16 : 2 : : 40 : 5 of 15,
16 : 2 : : 40 : 5 of 17,
16 : 2 : : 40 : 5 of 18,
16 : 10 : : 40 : 25 of 22, *A.*

INVOLUTION.

¶ LXXXIV.

Exercises for the Slate. (p. 246.)

1. *A.* $900 \times 900 = 810000$.
2. *A.* $211 \times 211 = 44521 \times 211 = 9393931$.
3. *A.* $80 \times 80 = 6400 \times 80 = 512000 \times 80 = 40960000$.
4. *A.* $7 \times 7 = 49 \times 7 = 343 \times 7 = 2401 \times 7 = 16807$.
5. *A.* $\frac{11}{12} \times \frac{11}{12} = \frac{121}{144} \times \frac{11}{12} = \frac{1331}{1728}$, and $\frac{8}{9} \times \frac{8}{9} = \frac{64}{81} \times \frac{8}{9} = \frac{512}{729}$, and $\frac{4}{39} \times \frac{4}{39} = \frac{16}{1521} \times \frac{4}{39} = \frac{64}{59319}$.
6. *A.* $5\frac{1}{2} = \frac{11}{2} \times \frac{11}{2} = \frac{121}{4} = 30\frac{1}{4}$.
7. *A.* $16\frac{1}{2} = \frac{33}{2} \times \frac{33}{2} = \frac{1089}{4} = 272\frac{1}{4}$.
8. *A.* $8 \times 8 = 64 \times 8 = 512 \times 8 = 4096 \times 8 = 32768$.
9. *A.* $10 \times 10 = 100 \times 10 = 1000 \times 10 = 10000$.
10. *A.* $6 \times 6 = 36 \times 6 = 216 \times 6 = 1296$.
11. *A.* $25 \times 25 = 625 \times 25 = 15625$.

EXTRACTION OF THE SQUARE ROOT

¶ LXXXVI.

Exercises for the Slate. (p. 249, 253.)

(1.)

6400 (80, *A.*
6400
00

(2.)

2500 (50, *A.*
2500
00

(3.)

10 × 10 × 100 = 10000 (100, *A.*
10000
0000

(4.)

2500 (50, *A.*
2500
00

(5.)

1000000 × 1000000 = 1000000000000 (1000000, *A.*
1000000000000
000000000000

(6.)

360000 (600, *A.*
360000
0000

7. *A.* $\sqrt{36} = 6$, and $36 \times 36 = 1296 - 6 = 1290$.

8. *A.* $\sqrt{4900} = 70$; then $4900 \times 4900 = 24010000 - 70 = 24009930$.

9. *A.* $\sqrt{81} = 9$; then $81 \times 81 = 6561 - 9 = 6552$.

11. *A.* $\sqrt{\frac{9}{16}} = \frac{3}{4}$; then $\frac{9}{16} \times \frac{9}{16} = \frac{81}{256} - \frac{3}{4} = \frac{444}{1024} = \frac{111}{256}$.

12. *A.* $\sqrt{4} = 2$, and $\sqrt{9} = 3 + 2 = 5$.

13. *A.* $\sqrt{4} = 2$, and $9 \times 9 = 81 + 2 = 83$.

14. *A.* $30\frac{1}{4} = \frac{121}{4}$, and $\sqrt{\frac{121}{4}} = \frac{11}{2} = 5\frac{1}{2}$, and $272\frac{1}{4} = \frac{1089}{4}$; $\sqrt{\frac{1089}{4}} = \frac{33}{2} = 16\frac{1}{2} + 5\frac{1}{2} = 22$.

(18.)

470596 (686, *A.*
36
128) 1105
1024
1366) 8196
8196
0

(19.)

1048576 (1024 *A.*
1
202) 0485
404
2044) 8176
8176
0

(20.)

$\dot{2}1\dot{2}5\dot{7}6\dot{4}$ (1458, *A.*
1
24) 112
96
285) 1657
1425
2908) 23264
23264
0

(21.)

$\dot{6}7\dot{1}8\dot{4}6\dot{4}$ (2592, *A.*
4
45) 271
225
509) 4684
4581
5182) 10364
10364
0

(22.)

$2\dot{3}0\dot{5}9\dot{2}0\dot{4}$ (4802, *A.*
16
88) 705
704
9602) 19204
19204
0

(23.)

$4\dot{2}9\dot{4}9\dot{6}7\dot{2}9\dot{6}$ (65536, *A.*
36
125) 694
625
1305) 6996
6525
13103) 47172
39309
131066) 786396
786396
0

(24.)

$4\dot{0}$ (6,3245 +, *A.*
36
123) 400
369
1262) 3100
2524
12644) 57600
50576
126485) 702400
632425
69975

(25.)

$\dot{3}0$ (5,4772 +, *A.*
25
104) 500
416
1087) 8400
7609
10947) 79100
76629
109542) 247100
219084
28016

26. *A.* $\surd 64 = 8$, and $\surd 144 = 12$, and $\frac{8}{12} = \frac{2}{3}$.

27. *A.* $\frac{450}{2048} = \frac{225}{1024}$, and $\surd 225 = 15$, and $\surd 1024 = 32$ $= \frac{15}{32}$.

28. *A.* $\frac{224}{350} = \frac{16}{25}$, and $\surd \frac{16}{25} = \frac{4}{5}$.

29. *A.* $\frac{121}{1234321} = \frac{1}{10201}$, and $\surd \frac{1}{10201} = \frac{1}{101}$.

(30.)

$\frac{70}{84} = ,8\dot{3}3\dot{3}3\dot{3}3\dot{3}$ (,9128 +, *A*
81
181) 233
181
1822) 5233
3644
18248) 158933
145984
12949

(31.)

$\frac{11}{12} = ,9\dot{1}6\dot{6}6\dot{6}6\dot{6}$ (,9574+, *A.*

81

185) 1066

925

1907) 14166

13349

19144) 81766

76576

5190

(32.)

$\frac{9}{13} = ,6\dot{9}2\dot{3}0\dot{7}6\dot{9}2\dot{3}$ (,83205+ *A.*

64

163) 523

489

1662) 3407

3324

166405) 836923

832025

4898

33. *A.* $420\frac{1}{4} = \frac{1681}{4}$, and $\sqrt{\frac{1681}{4}} = \frac{41}{2}$, and $\frac{41}{2} = 20\frac{1}{2}$.

34. *A.* $912\frac{1}{25} = \frac{22801}{25}$, and $\sqrt{\frac{22801}{25}} = \frac{151}{5} = 30\frac{1}{5}$.

(35.)

$5\dot{6}2\dot{5}$ (75, *A.*

49

145) 725

725

0

(36.)

$\dot{2}4\dot{3}3\dot{6}$ (156, *A*

1

25) 143

125

306) 1836

1836

(37.)

$4\dot{0}9\dot{6}$ (64, *A.*
36
124) 496
496
0

(38.)

40
60
100
4
400 (20, *A.*
4
00

(39.)

$14\dot{4}0\dot{0}$ (120, *A.*
1
22) 44
44
00

(40.)

4
4
16
4
64 (8, *A.*
64
0

(41.)

5
5
25
4
100 (10, *A.*
1
00

5
5
25
16
150
25
400 (20, *A.*
4
00

5
5
25
36
150
75
900 (30, *A*
9
00

(42.)

140, 2, 20
4
562
40
22500 (150, *A.*
1
25) 125
125
00

(43.)

A. 1 mile = 320 rods; then 45 × 320 = 14400, length of the road in rods, and 14400 × 4, breadth of do., = 57600, and $\surd$57600 = 240.

EXTRACTION OF THE CUBE ROOT.

¶ LXXXVII. (p. 258.)

(9.)

$1\dot{7}57\dot{6}$ (26, *A.*
8
2 × 2 × 300 = 1200) 9576
7200
2 × 30 × 36 = 2160
6 × 6 × 6 = 216
9576

(10.)

$57\dot{1}78\dot{7}$ (83, *A.*
512
8 × 8 × 300 = 19200) 59787
57600
8 × 30 × 9 = 2160
3 × 3 × 3 = 27
59787

(11.)

$$
\begin{array}{rrl}
 & 97\dot{0}29\dot{9} & (\ 99,\ \mathit{A}. \\
 & 729 & \\ \cline{2-2}
9\times 9\times 300=24300\ ) & 241299 & \\ \cline{2-2}
 & 218700 & \\
9\times 30\times 81= & 21870 & \\
9\times 9\times 9= & 729 & \\ \cline{2-2}
 & 241299 &
\end{array}
$$

(12.)

$$
\begin{array}{rrl}
 & \dot{2}00\dot{0}37\dot{6} & (\ 126,\ \mathit{A} \\
 & 1 & \\ \cline{2-2}
1\times 1\times 300=300\ ) & 1000 & \\ \cline{2-2}
 & 600 & \\
1\times 30\times 4= & 120 & \\
2\times 2\times 2= & 8 & \\ \cline{2-2}
 & 728 & \\ \cline{2-2}
12\times 12\times 300=43200\ ) & 272376 & \\ \cline{2-2}
 & 259200 & \\
12\times 30\times 36= & 12960 & \\
6\times 6\times 6= & 216 & \\ \cline{2-2}
 & 272376 &
\end{array}
$$

(13.)

$$
\begin{array}{rrl}
 & \dot{3}79\dot{6}41\dot{6} & (\ 156,\ \mathit{A}. \\
 & 1 & \\ \cline{2-2}
1\times 1\times 300=300\ ) & 2796 & \\ \cline{2-2}
 & 1500 & \\
1\times 30\times 25= & 750 & \\
5\times 5\times 5= & 125 & \\ \cline{2-2}
 & 2375 & \\ \cline{2-2}
15\times 15\times 300=67500\ ) & 421416 & \\ \cline{2-2}
 & 405000 & \\
15\times 30\times 36= & 16200 & \\
6\times 6\times 6= & 216 & \\ \cline{2-2}
 & 421416 &
\end{array}
$$

(14.)

$$\begin{array}{rr}
 & 9\dot{4}818\dot{8}81\dot{6}\ (\ 456,\ A. \\
 & 64 \\ \hline
4 \times 4 \times 300 = 4800\ ) & 30818 \\ \hline
 & 24000 \\
4 \times 30 \times 25 = & 3000 \\
5 \times 5 \times 5 = & 125 \\ \hline
 & 27125 \\ \hline
45 \times 45 \times 300 = 607500\ ) & 3693816 \\ \hline
 & 3645000 \\
45 \times 30 \times 36 = & 48600 \\
6 \times 6 \times 6 = & 216 \\ \hline
 & 3693816
\end{array}$$

(15.)

$$\begin{array}{rr}
 & 17\dot{5}61\dot{6}00\dot{0}\ (\ 560,\ A. \\
 & 125 \\ \hline
5 \times 5 \times 300 = 7500\ ) & 50616 \\ \hline
 & 45000 \\
5 \times 30 \times 36 = & 5400 \\
6 \times 6 \times 6 = & 216 \\ \hline
 & 50616 \\ \hline
 & 000
\end{array}$$

(16.)

$$\begin{array}{rr}
 & 74\dot{8}61\dot{3}31\dot{2}\ (\ 908,\ A. \\
 & 729 \\ \hline
9 \times 9 \times 300 = 24300\ ) & 19613 \\ \hline
90 \times 90 \times 300 = 243000\ ) & 19613312 \\ \hline
 & 19440000 \\
90 \times 30 \times 64 = & 172800 \\
8 \times 8 \times 8 = & 512 \\ \hline
 & 19613312
\end{array}$$

(17.)

$73\dot{1}18\dot{9}18\dot{7}72\dot{9}$ (9009, *A.*

729

$9 \times 9 \times 300 = 24300$) 2189

$90 \times 90 \times 300 = 2430000$) 2189187

$900 \times 900 \times 300 = 243000000$) 2189187729

2187000000

$900 \times 30 \times 81 =$ 2187000

$9 \times 9 \times 9 =$ 729

2189187729

18. *A.* $\sqrt[3]{27} = 3$, and $\sqrt[3]{64} = 4$.

19. *A.* $\sqrt[3]{216} = 6$, and $\sqrt[3]{343} = 7$.

20. *A.* $\sqrt[3]{4913} = 17$, and $\sqrt[3]{9261} = 21$.

21. *A.* $\frac{1}{400} = ,0025$, and $\sqrt[3]{,0025} = ,13 +$.

22. *A.* $\frac{1}{25} = ,40000$, and $\sqrt[3]{,40000} = ,34 +$.

23. *A.* $\sqrt[3]{1728} = 12$.

24. *A.* $32 \times 16 \times 8 = 4096$, and $\sqrt[3]{4096} = 16$.

25. *A.* $16 \times 12 \times 12 = 2304$, and $63 \times 8 \times 7 = 3528$; then $2304 + 3528 = 5832$ solid feet thrown out, and $\sqrt[3]{5832} = 18$ feet, length of one side of the cubical mound.

26. *A.* $1 \times 1 \times 1 = 1$; $2 \times 2 \times 2 = 8$; $3 \times 3 \times 3 = 27$; $4 \times 4 \times 4 = 64$; $6 \times 6 \times 6 = 216$; $10 \times 10 \times 10 = 1000$; $20 \times 20 \times 20 = 8000$.

27. *A.* $\sqrt[3]{1} = 1$, $\sqrt[3]{8} = 2$; $\sqrt[3]{27} = 3$; $\sqrt[3]{64} = 4$; $\sqrt[3]{125} = 5$; $\sqrt[3]{216} = 6$; $\sqrt[3]{1000} = 10$; $\sqrt[3]{8000} = 20$.

28. *A.* $3 \times 3 \times 3 = 27$, and $6 \times 6 \times 6 = 216$; then 27 : 216 : : 4 : 32.

29. *A.* $3 \times 3 \times 3 = 27$, and $6 \times 6 \times 6 = 216$; then 27 : 216 : : 160 : 1280.

30. *A.* $1 \times 1 \times 1 = 1$, and $2 \times 2 \times 2 = 8$; then 1 : 8 : : 1 : 8.

31. *A.* $1 \times 1 \times 1 = 1$, and $12 \times 12 \times 12 = 1728$; then 1 : 1728 : : 1 : 1728.

32. *A.* $\sqrt[3]{1000000} = 100$; then 1 : 8000 : : 100 : *800000.*

ARITHMETICAL PROGRESSION.

¶ LXXXVIII. (p. 259—261.)

2. *A.* $23-3=20\div(11-1)=2$.

3. *A.* $45-5=40\div(6-1)=8$.

4. *A.* The amount of 1 dollar, for the 1st year, is $1,06; the extremes, then, are 106, and 220.

$220-106=114\div(20-1)=,06=6$ per cent.

5. *A.* $2\times59=118+5=\$1,23$.

6. *A.* 2, com. diff., × 10, number of terms, less 1, $=20+3$, first term, $=23$.

7. *A.* 3, com. diff., $\times(6-1)=15+5=20$.

8. *A.* $6\times(20-1)=114+106$, the 1st term, $=\$2,20$.

9. *A.* $6+24=30\div2=15\times10$, the number of terms, $=\$1,50$.

10. *A.* $273+3=276\div2=138\times40=5520$.

11. *A.* The least number which it strikes, is 1, and the greater, 12; 1 and 12, then, are the extremes.

$12+1=13\div2=6\frac{1}{2}\times12$, different times of striking, $=78$.

12. *A.* The butcher gave $100 for the last.

$\$100+\$1=101\div2=50\frac{1}{2}\times100$ oxen, $=\$5050$.

13. *A.* 1000, the last, + 1, the first, $=1001\div2=500\frac{1}{2}\times1000=500500$.

14. One end being 18, and the other coming to a point, herefore, the extremes are 18 and 0.

$18\div2=9\times2=18$ feet.

15. *A.* $20+0=20\div2=10\times60=600$.

16. *A.* $58-3=55\div5=11$, the number of terms, less 1; then, $11+1=12$.

17. *A.* $45-3=42\div6=7+1=8$.

18. *A.* $32-4=28\div4=7+1=8$.

GEOMETRICAL PROGRESSION

¶ LXXXIX. (p. 262, 263.)

(3.)

4 + 3 + 2 = 9, 1 less than 10, the number of terms.

1, 2, 3, 4, indices.
3, 9, 27, 81, powers.
27
2187 × 9
19683 × 4, 1st term.
A. 78732.

(4.)

4 + 3 + 2 = 9, being 1 less than 10.

1, 2, 3, 4,
3, 9, 27, 81 × 27
2187 × 9
19683 × 10, 1st term.
A. 196830 dollars.

(5.)

6 + 5 + 4 + 2 = 17, being 18 — 1.

1, 2, 3, [illegible], 5, 6,
4, 16, 64, 256, 1024, 4096,
1024
4194304 × 256
1073741824 × 16
A. $171798691,84.

The 1st term being 1, to multiply by it, would make no difference.

(6.)

1, 2, 3, 4, 5, 6
3, 9, 27, 81, 243, 729
243
177147 × 81
14348907 × 9
129140163
× 3 = 1st term.
A. 387420489.

6 + 5 + 4 + 2 = 17.

(7.)

1, 2, 3, 4, 5, 6, 7
2, 4, 8, 16, 32, 64, 128
× 64
8192 × 32
262144 × 8
2097152 × 4
8388608 × 2, 1st term.
A. $167772,16.

7 + 6 + 5 + 3 + 2 = 23.

(8.)

1, 2, 3
3, 9, 27
27
2, 1st term.
54, last term.
× 3, ratio.
162
— 2, 1st term.
160 ÷ (3 — 1)
A. 80.

1 + 2 = 3

(9.)

A 6400 × 6, ratio, = 38400 — 5 = 38395 ÷ (6 — 1) = 7679.

(10.)

1, 2, 3, 4

3, 9, 27, 81

× 27

2187 × 9

19683 × 10, 1st term.

196830 × 3, ratio.

Ratio, less 1. 590490 — 10, 1st term.

3 — 1 = 2) 590480

A. 295240.

(11.)

1, 2, 3, 4, 5

3, 9, 27, 81, 243

81

19683 × 27

531441 × 3

1594323

[illegible] × 4, 1st term.

6377292, last term.

3, ratio

19131876 — 4, 1st term.

19131872 ÷ (3 — 1)

A. 95659,36, [illegible]

(12.)

1, 2, 3, 4, 5, 6, 7, 8
3, 9, 27, 81, 243, 729, 2187, 6561
× 2187
14348907 × 729
10460353203 × 243
2541865828329 × 81
205891132094649 × 3
617673396283947 × ratio 3.
1853020188851841 — 1, 1st term.
1853020188851840 ÷ 2, ratio less 1.
A. $9265100944259,20

8 + 7 + 6 + 5 + 4 + 1 = 31, 1 less than the number of nails.

(13.)

1, 2, 3, 4, 5
2, 4, 8, 16, 32 × 16
512 × 4
2048 × $5, ½ eagle.
10240 × 2, ratio.
20480 — 5, 1st term.
20475 — $100
A. $20375.

(14.)

1, 2, 3, 4, 5
2, 4, 8, 16, 32 × 16
512 × 2
1024 × 101, 1st term.
103424 × 2, ratio.
206848 — 101
A. 206747; the ratio, less 1, is 1.

1840
1620
2|0) 22|0
11 number of terms.

ANNUITIES AT SIMPLE INTEREST.

¶ XC. (p. 264.)

(2.)

7th year,	$85,20
6th year,	$81,60
5th year,	$78,00
4th year,	$74,40
3d year,	$70,80
2d year,	$67,20
1st year,	$63,60
Paid when due,	$60,00
A.	$580,80

(3.)

1st year,	$636,00	= $1236,00
	$600,00	
2d year,	$672,00	= $1908,00
1st year,	$636,00	
	$600,00	
3d year,	$708,00	= $2616,00
2d year,	$672,00	
1st year,	$636,00	
	$600,00	
6th year,	$816,00	= $4956,00
5th year,	$780,00	
4th year,	$744,00	
3d year,	$708,00	
2d year,	$672,00	
1st year,	$636,00	
	$600,00	
	Amount, carried forward,	$10716,00

Amount, brought forward, $10716,00

7th year,	$852,00	
6th year,	$816,00	
5th year,	$780,00	
4th year,	$744,00	= $5808,00
3d year,	$708,00	
2d year,	$672,00	
1st year,	$636,00	
	$600,00	
9th year,	$924,00	
8th year,	$888,00	
7th year,	$852,00	
6th year,	$816,00	
5th year,	$780,00	= $7620,00
4th year,	$744,00	
3d year,	$708,00	
2d year,	$672,00	
1st year,	$636,00	
	$600,00	
	A.	$24144,00

TO FIND THE PRESENT WORTH OF AN ANNUITY.

(p. 265.)

(5.)

$200 ÷ $1,04 = $192,307
$200 ÷ $1,08 = $185,185
$200 ÷ $1,12 = $178,571
A. $556,063

(6.)

$$\left.\begin{array}{l}\$800 \div \$1,06 = \$754,716 \\ \$800 \div \$1,12 = \$714,285\end{array}\right\} = \$1469,001 +$$

$$\left.\begin{array}{l}\text{For 2 years,} = \$1469,001 \\ \$800 \div 1,18 = \$\ 677,966\end{array}\right\} = \$2146,967 +$$

$$\left.\begin{array}{l}\text{For 3 years,} = \$2146,967 \\ \$800 \div 1,24 = \$\ 645,161 \\ \$800 \div 1,30 = \$\ 615,384\end{array}\right\} = \$3407,512 +$$

A. $7023,480.

ANNUITIES AT COMPOUND INTEREST.

¶ XCI. (p. 265—267.)

(2.)

$$\begin{array}{r}\$150 \times 6 \\ \hline 9,00 \\ 150 \\ \hline 159 \times 6 \\ \hline 9,54 \\ 159 \\ \hline 168,54\end{array}$$

$$\begin{array}{rl}\text{Amount for 2 years,} & = \$168,54 \\ \text{Amount for 1 year,} & = \$159,00 \\ \text{3d year,} & = \underline{\$150,00} \\ \textit{A.} & \underline{\$477,54}\end{array}$$

(4.)

By Table I

$400 × 2,06 = $ 824,00, for 2 years.
$400 × 3,1836 = $ 1273,44, for 3 years.
$400 × 4,3746 = $ 1749,84, for 4 years.
$400 × 6,9753 = $ 2790,12, for 6 years.
$400 × 16,8699 = $ 6747,96, for 12 years.
$400 × 36,7855 = $14714,20, for 20 years.
A. $28099,56.

(5.)

70 — 21 years, = 49 years, by Table, = $261,7208
100
A. $26172,08

(7.)

By Table II.

A. For 5 years, = 4,21236 × 200 = $842,472.

(9.)

For 2 years, $60 × 1,83339 = $110,0034
For 3 years, $60 × 2,67301 = $160,3806
For 4 years, $60 × 3,46510 = $207,9060
For 8 years, $60 × 6,20979 = $372,5874
For 20 years, $60 × 11,46992 = $688,1952
For 30 years, $60 × 13,76483 = $825,8898
A. $2364,9624.

(11.)

A. $688,95 ÷ 11,46992 = $60 +.

(12.)

Table II., by adding the decimals omitted, gives us the following divisor :—

```
3,4651056 ) 27000,0000 ( 7791,97032
            242557392
             274426080
             242557392
              318686880
              311859504
                68273760
                34651056
                336227040
                311859504
                 243675360
                 242557392
                   111796800
                   103953168
                     78436320
                     69302112
                      9134208, rem.

     1,06 ) 7791,97032 ( 7350,915, First Note.
            742
             371
             318
              539
              530
                970
                954
                 163
                 106
                  572
                  530
                   42, rem.
```

(12—*continued.*)

1,1236) 7791,97032 (6934,825, Second Note.
67416
105037
101124
39130
33708
54223
44944
92792
89888
29040
22472
65680
56180
9500, rem.

1,191016) 7791,97032 (6542,288, Third Note.
7146096
6458743
5955080
5036632
4764064
2725680
2382032
3436480
2382032
10544480
9528128
10163520
9528128
635392, rem.

(12—*continued.*)

1,262476) 7791,97032 (6171,97, Fourth Note.
7574856
2171143
1262476
9086672
8837332
2493400
1262476
12309240
11362284
9469560
8837332
632228, rem.

Proof of the Foregoing Question.

4th Note, $6171,97 × 6
370,3182
6171,97
3d Note, $6542,2882 × 6
392,537292
6542,2882
2d Note, $6934,825492 × 6
416,08952952
6934,825492
1st Note, $7350,91502152 × 6
441,0549012912
7350,91502152
$7791,9699228112, being the annuity which $27000 will purchase, lacking about 1 mill. If the fractions, which were rejected in the previous operations, had been retained, the above discrepancy would have been prevented

(12—*continued.*)

The foregoing proof, it will be perceived, consists in finding the amount of the 4th Note at compound interest for 4 years; in which process, the other three Notes are reproduced, with their several amounts, all of which may be arranged as follows, viz. :—

The 1st is $7350,915,	amounting, for 1 yr.,	$7791,97032
The 2d is $6934,825,	amounting, for 2 yrs.,	$7791,97032
The 3d is $6542,288,	amounting, for 3 yrs.,	$7791,97032
The 4th is $6171,97,	amounting, for 4 yrs.,	$7791,97032
	A.	$2999,99998+.

PERMUTATION.

¶ XCII. (p. 268.)

(2.)

1 × 2

2 × 3

6 × 4

24 × 5

A. 120

O*

(3.)

1×2
2×3
6×4
24×5
120×6
720×7
5040×8
40320×9
362880×10
3628800×11
39916800×12
479001600×13
6227020800×14
87178291200×15
1307674368000 changes × 3
A. 39230231040000 seconds.

(4.)

1×2
2×3
6×4
24×5
120×6
720×7
5040×8
40320×9
362880×10
$3628800 \div 365$
A. $9941\frac{335}{365}$ years.

(5.)

1 × 2

2 × 3

6 × 4

24 × 5

120 × 6

720 × 7

5040 × 8

40320 × 9

362880 × 10

3628800 × 11

39916800 × 12

479001600 × 13

6227020800 × 14

87178291200 × 15

1307674368000 × 16

20922789888000 × 17

355687428096000 × 18

6402373705728000 × 19

121645100408832000 × 20

2432902008176640000 × 21

51090942171709440000 × 22

1124000727777607680000 × 23

25852016738884976640000 × 24

620448401733239439360000 × 25

15511210043330985984000000 × 26

A. 403291461126605635584000000.

SINGLE POSITION.

¶ XCIII. (p. 269.)

2. *A*. Suppose 50; then 50 × 6 × 10 = 30,00, and 30 + 50 = 80; then 80 : 1600 : : 50 : 1000.

3. *A*. Suppose A's share was 20; then B's 60, and C's 240, and 20 + 60 + 240 = 320; and, as 320 : 1920 : : 20 : 120, A's share. Then 120 × 3 = 360, B's; 360 × 4 = 1440, C's.

4. *A*. Suppose he had 24; then $\frac{1}{3}$ = 8, $\frac{1}{4}$ = 6, $\frac{1}{6}$ = 4, and 8 + 6 + 4 = 18; and as 18 : 45 : : 24 : 60.

5. *A*. Suppose 30; then $\frac{6}{10}$ = 18 × 7 = 126; $\frac{2}{3}$ of 30 = 20, and 20 + 126 = 146; then, as 146 : 292 : : 30 : 60.

6. *A*. Suppose 30; then 30 × 7 = 210 ÷ 6 = 35, and 35 : 14 : : 30 : 12.

DOUBLE POSITION.

¶ XCIV. (p. 271.)

2. *A*. Suppose A's age was 25; then B's, being 10 more, will be 35; and C's, being equal to both, will be 60; and 25 + 35 + 60 = 120; and the error is 20. Next suppose A's age to be 15; then B's will be 25, and C's 40; and 15 + 25 + 40 = 80; the error now is 20. The errors are unlike, for the first number supposed, proved too great, and the second, too small. The difference between them, therefore, is 20 + 20 = 40, their sum. Then, as (diff. of errors) 40 : (diff. of suppositions) 10 : : (either error, say the first) 20 : (difference between it and the true number) 5. And 25 — 5 (the supposition being too great) = 20, A's age; 20 + 10 = 30, B's age; and 20 + 30 = 50, C's age.

3. *A.* Suppose the income is \$200. A saves ¼ = \$50, and, of course, spends \$150. B spends \$150 more than A, which makes \$300. He therefore exceeds his income by \$100 a year, and, in eight years, will be \$800 in debt. According to the fact, however, he is but \$400 in debt at this time; so that the error is \$400. Next, suppose the income is \$300. Then, A will spend \$225, and B, \$375, per annum; and as B exceeds his income by \$75 per annum, in eight years, he will be in debt \$600. This error is \$200; the difference of the errors, both being alike, is 400 — 200 = 200. Then, as 200 : 100 : : 200 : 100; and 200 + 200 = 400, the income; and 400 — 100 = 300, the sum spent by A; and 300 + 150 = 450, the sum spent by B.

4. *A.* Suppose the whole length of the fish is 30 feet; the head is 8 feet, and half the body, by the supposition, is 15; then 8 + 15 = 23, length of the tail. And (the head) 8 + 23 (the tail) = 31 for the length of the fish; so that the first error is 1. Next, suppose 28. Now, (the head) 8 + 14 (half the body) = 22, length of the tail, and (the head) 8 + 22 (the tail) = 30, for the length of the fish. The second error, then, is 2. The difference of the errors, they being alike, is 2 — 1 = 1; then, as 1 : 2 : : 1 : 2; and 30 + 2 = 32, length of the fish.

5. *A.* Suppose he wrought 20 days; then he would be idle 60 days; for 80 — 20 = 60. Twenty days, at 75 cts. per day, amounts to \$15; sixty days, at 50 cts. per day, amounts to \$30. Then the laborer forfeits \$15; but by the question, he receives \$25, so that the error 25 + 15 = 40. Next, suppose he wrought 30 days; then he would be idle 50 days. Thirty days, at 75 cts., amounts to \$22,50, and 50 days, at 50 cts., to \$25; so that the laborer would forfeit \$2,50. The second error, then, is \$27,50. The difference of errors is \$12,50. Then, as 12,50 : 10 : : 40 : 32; and 20 + 32 = 52, the number of days he wrought; and 80 — 52 = 28, the number of days he was idle.

MISCELLANEOUS EXAMPLES.

(p. 272—274.)

2. *A.* $20 \div 2 = 10 \times 40 =$ 400 rods.

A. $40 \times 40 = 1600$; $30 \times 30 = 900$; $1600 + 900 = 2500$, the square root of which is 50, the hypothenuse.

(3.)

$80 \times 80 = 6400$
$60 \times 60 = 3600$
$\sqrt{10000}$
A. 100 yards.

(4.)

$40 \times 40 = 1600$
$24 \times 24 = 576$
$\sqrt{1024} = 32$ ft.

from the middle of the street to one house; then twice 32 ft., making 64 ft., is the entire width of the street. *A.* 64 feet.

(5.)

$120^2 = 14400$
$100^2 = 10000$

6) 4400 (66,332 +, *A.*
36
126) 800
756
1323) 4400
3969
13263) 43100
39789
132662) 331100
265324
65776, rem.

{ 20 ft. $\div 2 = 10 +$ $90 = 100$, base.

(6.)

$40^2 = 1600$
$30^2 = 900$
A. $\sqrt{2500} = 50$ leagues.

(7.)

The diameter, 6 ft., $\div 2 = 3$ ft.; 19 paces $\times$ 3 ft. $= 57$ feet. Then $57 + 3 = 60$ feet, the base.

60 ft. $\times$ 60 ft. $= 3600$
80 ft. $\times$ 80 ft. $= 6400$
A. $\sqrt{10000} = 100$ ft.

(8.)

$3{,}141592 \times 8$
25,132736. *A.* 25,13 + feet.

(9.)

A. 12 ft. $\div$ 3,141592 $= 4$ ft., nearly.

(10.)

$3{,}141592 \times 8000$
25132,736000
A. 25132,7 miles, nearly.

11. *A.* $19 \div 2 = 9\frac{1}{2}$; $6 \div 2 = 3$; then $3 \times 9\frac{1}{2} = 28\frac{1}{2}$ feet.

13. *A.* $314{,}1592 \div 3{,}141592$; $\sqrt{100} = 10$, half the diameter, $\times 2 = 20$ feet.

14. *A.* $8000 \times 25000 = 200000000$.

(15.)

3,141592 × 12, diam., to get
37,699104 [the circumference.
12, diameter.
452,389248, area. [ameter.
2, being $\frac{1}{6}$ of 12, di-
904,778496
A. 904$\frac{7}{10}$ + solid inches.

(16.)

10 in. ÷ 2 = 5^2 = 25.
3,141592
× 25 sq. in.
78,539800 in. × 20 ft., length.
1570,79600 ÷ 144 (because sq. inches were multiplied into feet) = 11 feet, nearly, *A.*

(17.)

4 ÷ 2^2 = 4 × 3,141592
= 125,66368
10 ft. length.
125,663680
A. 125 + feet.

(18.)

8 diam. ÷ 2 = 4^2 = 16.
3,141592 × 16
50265472 × 10, being $\frac{1}{3}$ of 30.
A. 502,654720 feet.

(19.)

A. 3^2 = 9 × 3 (being $\frac{1}{3}$ of its height) = 27 feet.

(20.)

$\dot{9}26\dot{1}$ (21 ft., *A.*
2 × 2 × 2 = 8
2×2×300 = 1200 (1261
1200 × 1 = 1200
2 × 30×1×1 = 60
1 × 1 × 1 = 1
1261
000

(21.)

2648 acres, 3 roods, 1 rod.
× 4 roods.
= 10595
40 rods.
6) 42,38,01 (651 rods, *A.*
36
125) 638
625
1301) 1301
1301

(22.)

30 × 75 = 2250
5
35 ; 22,50 ÷ 35 = 64$\frac{2}{7}$ cts., *A.*

(23.)

56984
× 6, ratio.
341904
4, 1st term.
341900 ÷ 5, ratio, less 1.
A. 68380.

(24.)

1, 2, 3, 4, 5, 6, 7, 8, 9,
2, 4, 8, 16, 32, 64, 128, 256, 512

9 + 8 + 7 + 6 + 5 + 4 + 3 = 42.

256
131072 × 128
16777216 × 64
1073741824 × 32
34359738368 × 16
549755813888 × 8
4398046511104 × 2, ratio.
8796093022208 — 1, first term.
A. $87960930222,07 ÷ $60.
1466015504, nearly, ÷ 60 minutes
24433591 ÷ 24 hours.
1018065 days, nearly, ÷ 365.
2789 years, nearly, by counting without cessation.

365
52 sabbaths.
313 working days.
8 hours per day.
2504 hours, which were to be employed in counting, every year.

Then, taking the hours already calculated in the above process, viz. 24433591 ÷ 2504 hours, = 9757 +.

THE END.

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